TECHNOLOGY DEPT.

# Grinding and Finishing

february 1958

*in this issue:*

The How and Why of Abrasive Wheels —page 20

Surface Grinder Used for Grinding Outer Surface of Cone Shaped Parts —page 26

How to Dress Diamond Wheels for Best Performance —page 32

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Removal of 0.010" stock from Radome is accomplished by this surface grinder.

*a hitchcock publication*

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Contents • Feb. 1958

# Grinding and Finishing

**the magazine of abrasive metalworking operations**

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Subscription rates: $6.00 per year in U.S.A. $7.50 per year elsewhere.

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EPA

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—Cleaning of Coolants—

**This series of articles beginning in the March issue of GRINDING and FINISHING will cover evaluation of coolant cleaning equipment, installation of equipment, charts on recommended equipment for various operations and conditions and an explanation of clean coolant.**

# There's more *drive*

**Highest quality of sizing and roundness is obtained at low cost by grinding these anti-friction bearing rings on a CINCINNATI FILMATIC No. 4 Centerless Grinder equipped with Power Race Grinding Fixture.**

*(Photo courtesy of McGill Manufacturing Company, Inc., Valparaiso, Indiana*

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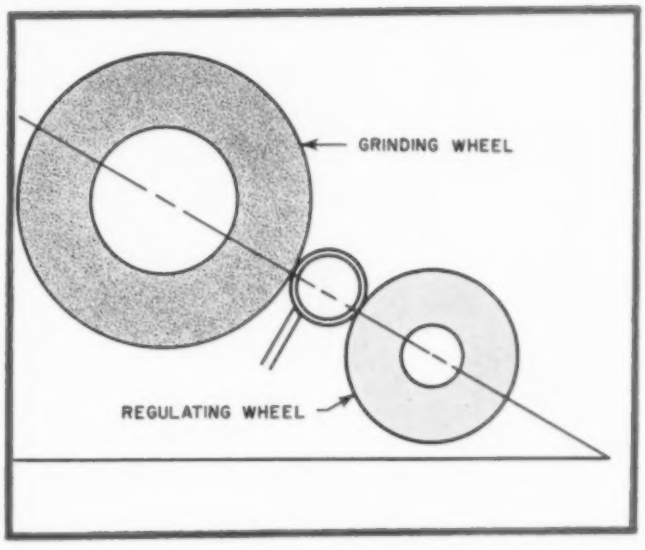


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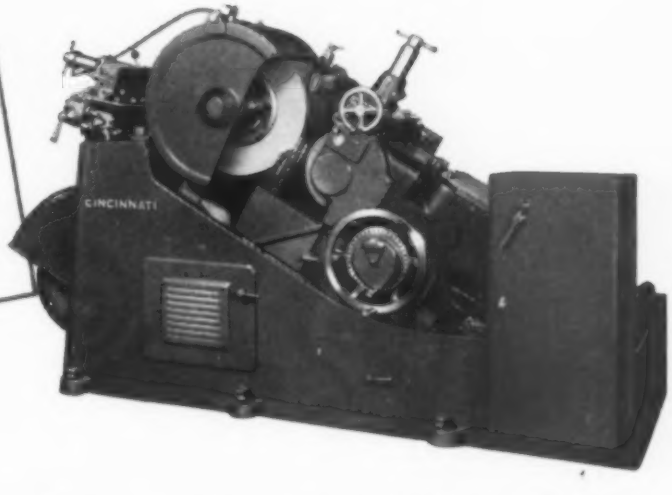

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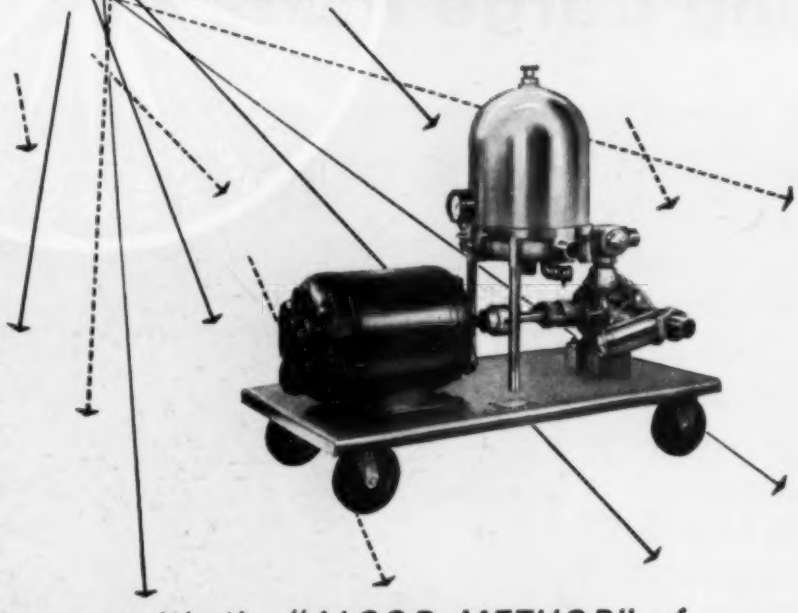
# 12 AVENUES TO COST REDUCTION



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**May we have our representative call and discuss a trial demonstration in your plant? No obligation of course.**

**A request on your letterhead will open these avenues for you.**

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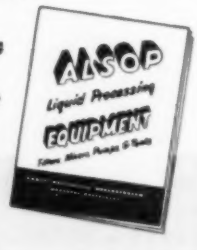


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# Letters to the Editor

## Standard Time Data

Your series on "Developing Standard Time Data for Grinding Operations" was an excellent example of the fine and varied service your publication offers. Please send us five (5) copies of the reprints of this series.

Thank you for a fine publication and your assistance in this matter

*Eugene J. Schulz,*
*Supt., Ind. Eng.*
*Le Roi Div.,*
*Westinghouse*
*Air Brake Co.*

WE ARE HAPPY TO OBLIGE.

## "Uniform Grinding Action as the Wheel Wears Down"

I would like to take this opportunity to tell you that the above article provided many of us here at Norton Co. with a great deal of information.

It was one of the clearest explanations of the value of gradated wheels I have read. Inasmuch as my main responsibility is the development of centerless and cylindrical wheels, I would appreciate it if you could make the necessary arrangements to send me six reprints of your article.

*John Clark, Jr.*
*Sales Eng. Dept.*
*Abrasive Div.*
*Norton Co.*

TEAR SHEETS SENT.

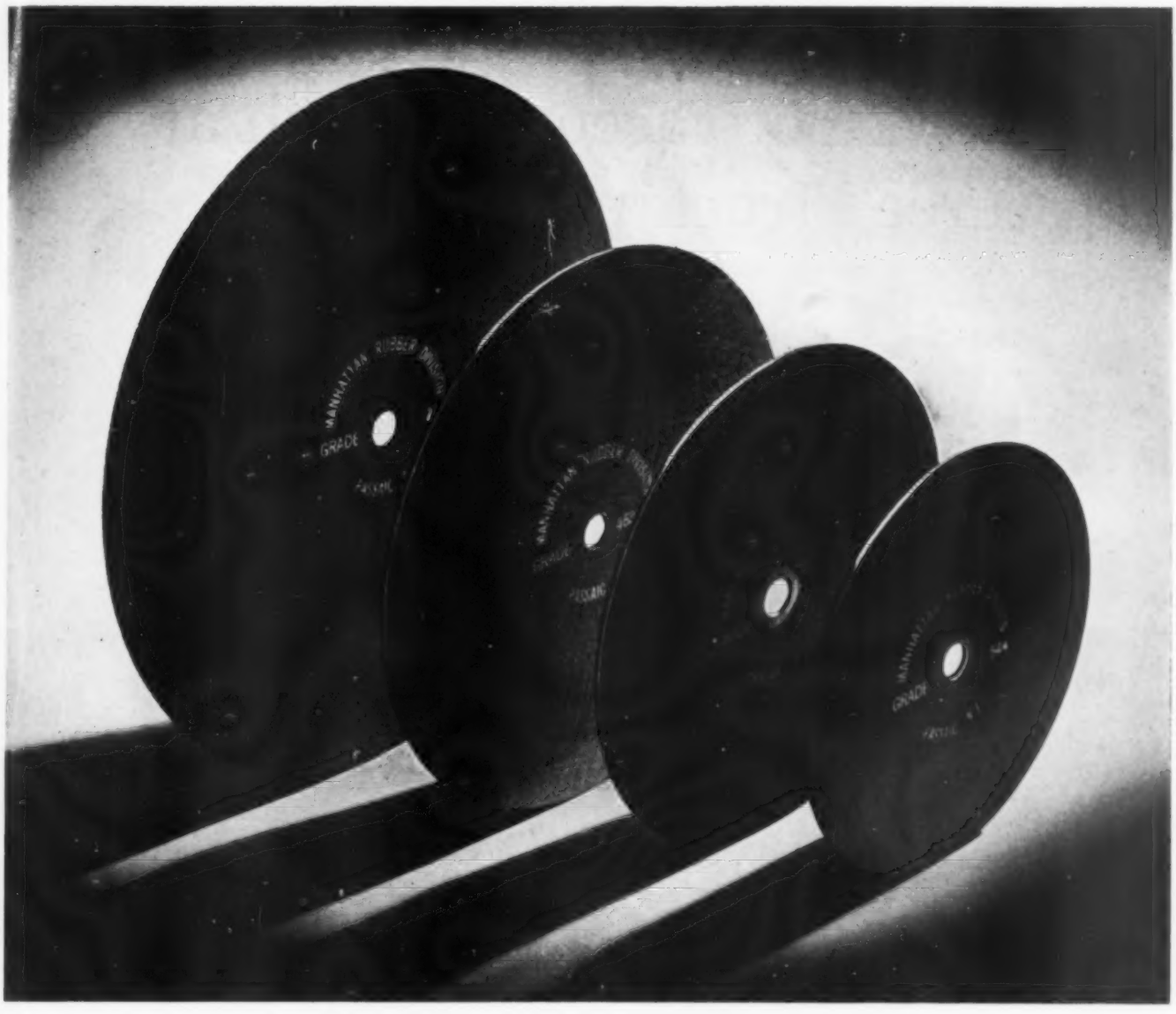
## Steel Conditioning

Just a note to express our appreciation of the excellent article appearing in the November issue of Grinding and Finishing, giving two very fine case histories on steel conditioning using our Mid-West automatic grinder.

As you know, there have been a number of articles written on this machine since its development, but our company and I want you to know that we at Mid-West think that your article is by far the finest; and, by the same token, want to let you know that we do appreciate your efforts.

*R. J. Foresman,*
*Vice-Pres.*
*Mid-West Abrasive Co.*

WE CERTAINLY APPRECIATE LETTERS LIKE YOURS.



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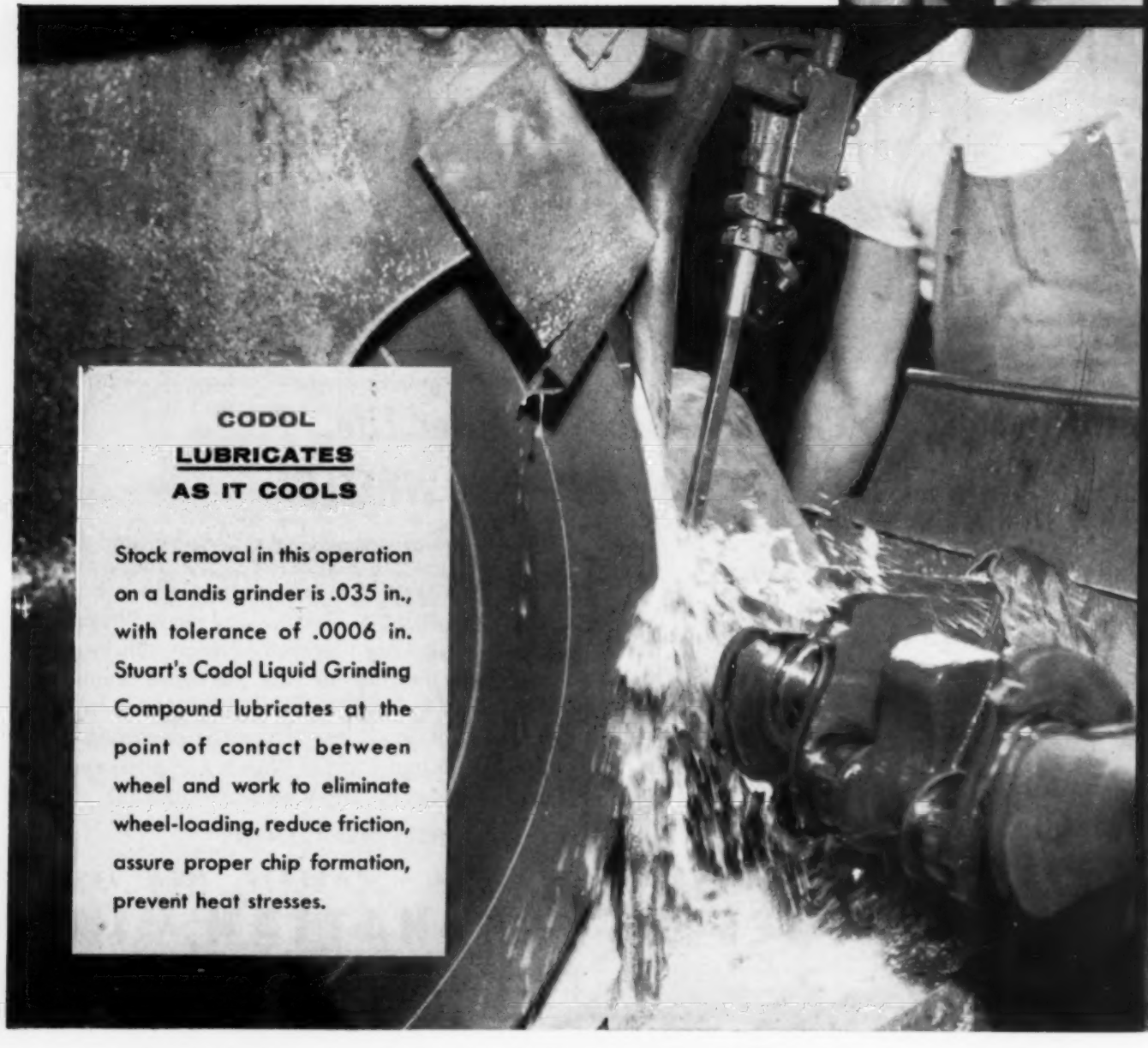
# Now grinding wheels run clean, give finer, more accurate finish at "big-three" truck plant

Stuart

**CODOL**

**LIQUID GRINDING COMPOUND**



**CODOL**

**LUBRICATES AS IT COOLS**

Stock removal in this operation on a Landis grinder is .035 in., with tolerance of .0006 in. Stuart's Codol Liquid Grinding Compound lubricates at the point of contact between wheel and work to eliminate wheel-loading, reduce friction, assure proper chip formation, prevent heat stresses.

Now that about 30 grinding machines in the crankshaft and other departments of this truck manufacturing plant are using Stuart's Codol Liquid Grinding Compound, all hands agree that results are much better, problems greatly reduced. Wheel-loading and burning, which were problems with a coolant previously used, are now eliminated and a distinct improvement in finish is noticeable. Codol efficiently cleans both wheel and work, drops all chips in the tank, and returns clean. Rusting, also once a problem, is now absent. Effective cleansing and superior lubricity characteristics keep temperatures down, eliminate burning, and improve accuracy.

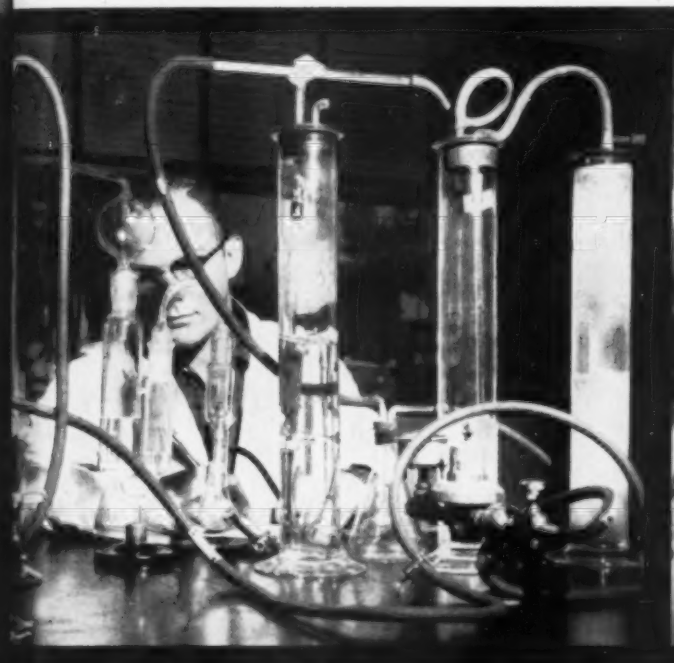
On-the-job economies with Codol add up to a substantial saving on costs experienced before. The previous compound had to be mixed one part coolant to 30 parts water. Excellent results are now achieved mixing one part Codol in 60 or 70 parts water. Clean-running wheels last longer, produce more parts. The previous coolant often went sour in a few days—Codol stays fresh for the full period between scheduled chip clean-outs.

## HERE'S WHAT THEY SAY ABOUT STUART'S CODOL:

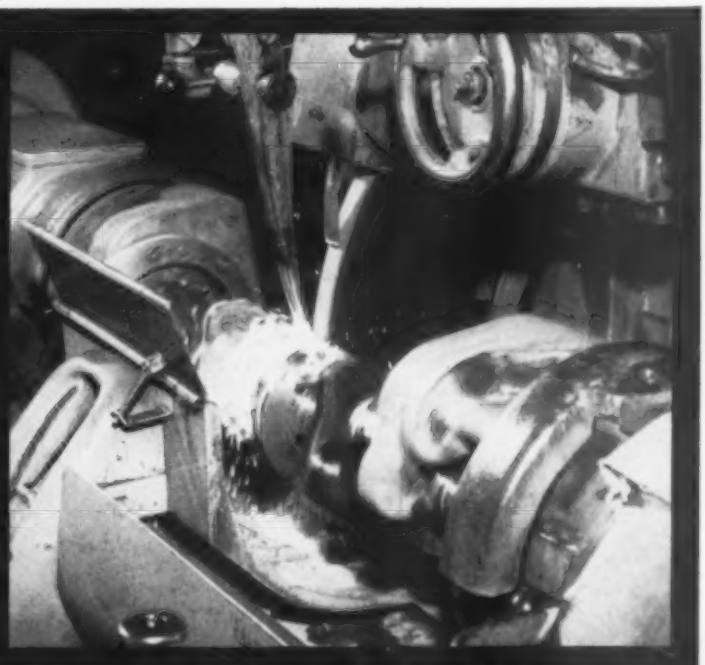
*"The wheel doesn't load up as it did before . . . finish is much improved . . . work runs cool, and this gives us improved accuracy . . . gives us more cuts per wheel."—grinding machine operator*

*"Wheel-loading and burning used to be serious problems. Now, we get better corners and no burning of the side wall. Codol permits us to run without pumping until the tank is almost full of sludge."—foreman*

*"Now we have no rusting whatever. Another point—we leave our Codol standing over the week end and have no worries about its deteriorating and going rancid"—grinding machine operator*



The plant's engineering laboratories tested numerous coolant materials and reported Codol to be unsurpassed as a remedy for the wheel-loading problem.



Codol eliminates tearing and scratching of the finish and has earned full credit for a marked increase in wheel life on thirty grinders throughout the plant.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# Industry Observer

**WASHINGTON**

*"You can find as many misconceptions of the Federal Reserve Board's role as there are falsehoods in 'Das Kapital'*," states the "Washington Report" published by the Chamber of Commerce of the United States." This is why the Board needs business understanding in its delicate, complex task of maintaining monetary stability."

"Despite much misguided opposition, the Board has fought a courageous two year battle against the depredations of inflation," the Report continues. "Now that there are indications that inflation may be subsiding, the Board has veered its course by lowering the discount rate. But misunderstanding continues to dog it."

**SPEECHES**

*Automation is becoming "more and more of an economic necessity,"* Louis Polk told a Special Manufacturing Conference of the American Management Association in New York City. "Improved increased mechanization would appear to be a necessary part of the braking apparatus that can help keep us from spinning into a spiral of uncontrolled inflation," the president of The Sheffield Corporation said.

High materials costs dictate that "rejects be kept to an absolute minimum," Polk declared, observing that as a consequence management is forced to consider modern inspection methods as an integral part of the new factory.

"Improvements in methods of inspection," Polk emphasized, "often act as the catalyst for quality improvements, and also for the economic development of new products."

Progress to greater levels of precision such as the present cooperative endeavor carried on by industry and government to reach for new accuracy of measurement in the order of one tenth of a millionth of an inch inevitably will lead to improvements in inspection techniques and open up new avenues of endeavor, Polk predicted.

*Public understanding of the nation's problems is the key to survival,* and the American press has a "very clear and pressing" duty to bring it about, Lammot du Pont Copeland, a vice president of the Du Pont Company, said in addressing the Associated Press Managing Editors Association.

"The decisions that lie ahead will determine whether education and experience have brought to this country a wisdom that will enable it to avoid the collapse that has inexorably overtaken all earlier democracies—all, without exception," Mr. Copeland said. "If we flunk the tests confronting us, it will not matter that we meant well."

*Sales of reinforced plastics reached the 168,000,000 pound level in 1957* or a 20 percent increase over the 140,000,000 pounds reported for 1956 according to a market study by the Reinforced Plastics Division of The Society of the Plastics Industry, Inc.

An important reason for the continued substantial yearly growth in the use of these materials, in the opinion of Clare E. Bacon of Owens-Corning Fiberglas Corp.,

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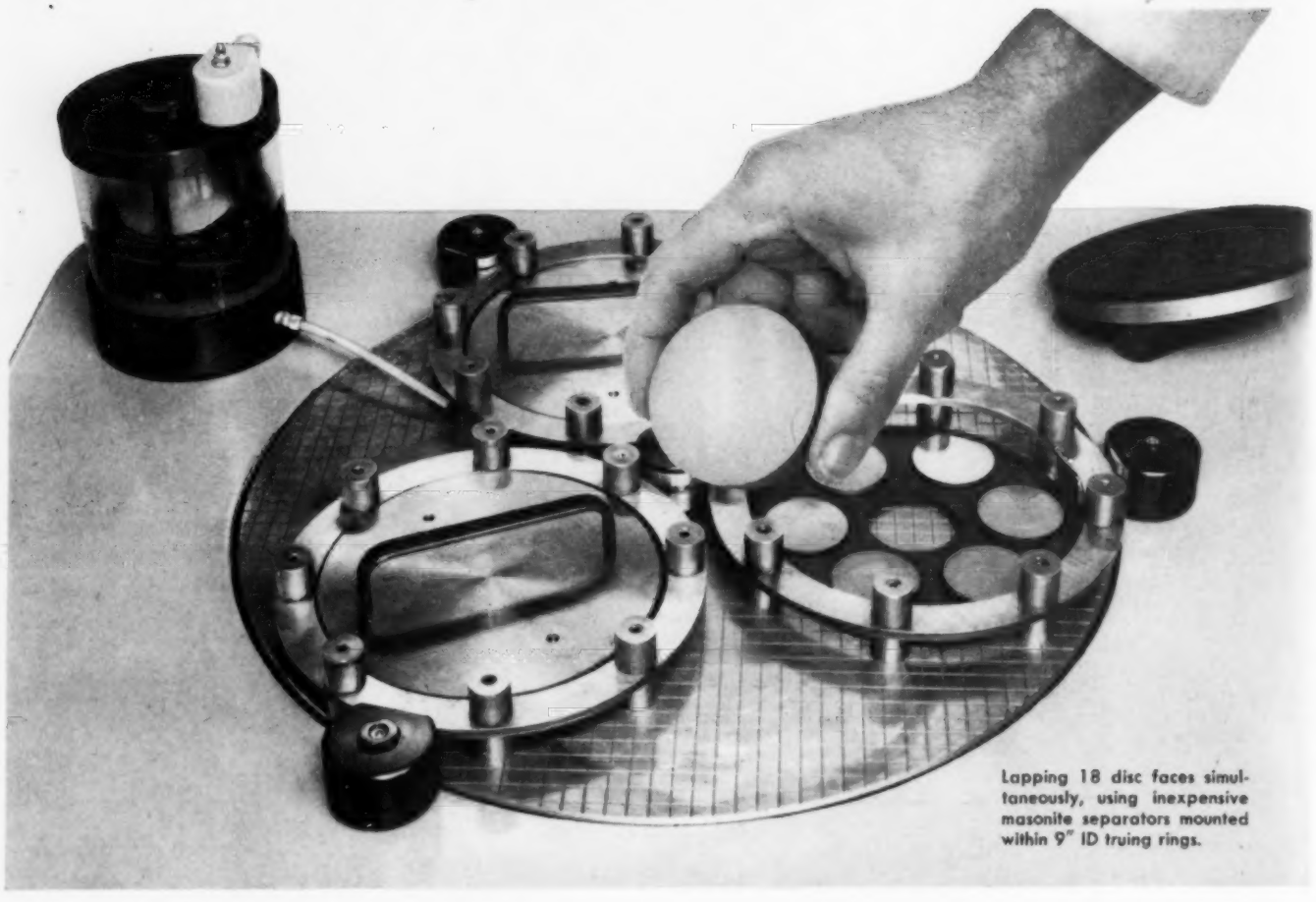

Lapping 18 disc faces simultaneously, using inexpensive masonite separators mounted within 9" ID truing rings.

# Now! Production Lapping with Flatness within One Lightband (.000011")

**Delivery from stock!** Machine furnished complete as shown with variable speed motor, compound tank with flexible tube, truing rings, and masonite blanks for making your own separators.

## New Taft-Peirce Semi-Automatic Lapping Machine delivers flatness within one lightband (.000011") and finish as low as 1 micro-inch RMS.

Taft-Peirce has developed this new 24" production-type Lapping Machine to provide a faster, more accurate method of generating true contact surfaces and low micro-inch finish.

Simple to set up — easy to use. Mount work-pieces in holding fixtures, set desired time cycle and the machine does the rest. Lapping compound is fed automatically and timer shuts off both machine and coolant flow at end of cycle. Inexperienced operators can be trained in minutes to supervise one or a complete battery, as needed.

### *Act now to cut production lapping costs!*

The new "semi-automatic" is inexpensive to buy, features low-cost operation and maintenance. Write for Bulletin MT-002 or contact your nearest Taft-Peirce agent.

**TAKE IT TO** TAFT-PEIRCE

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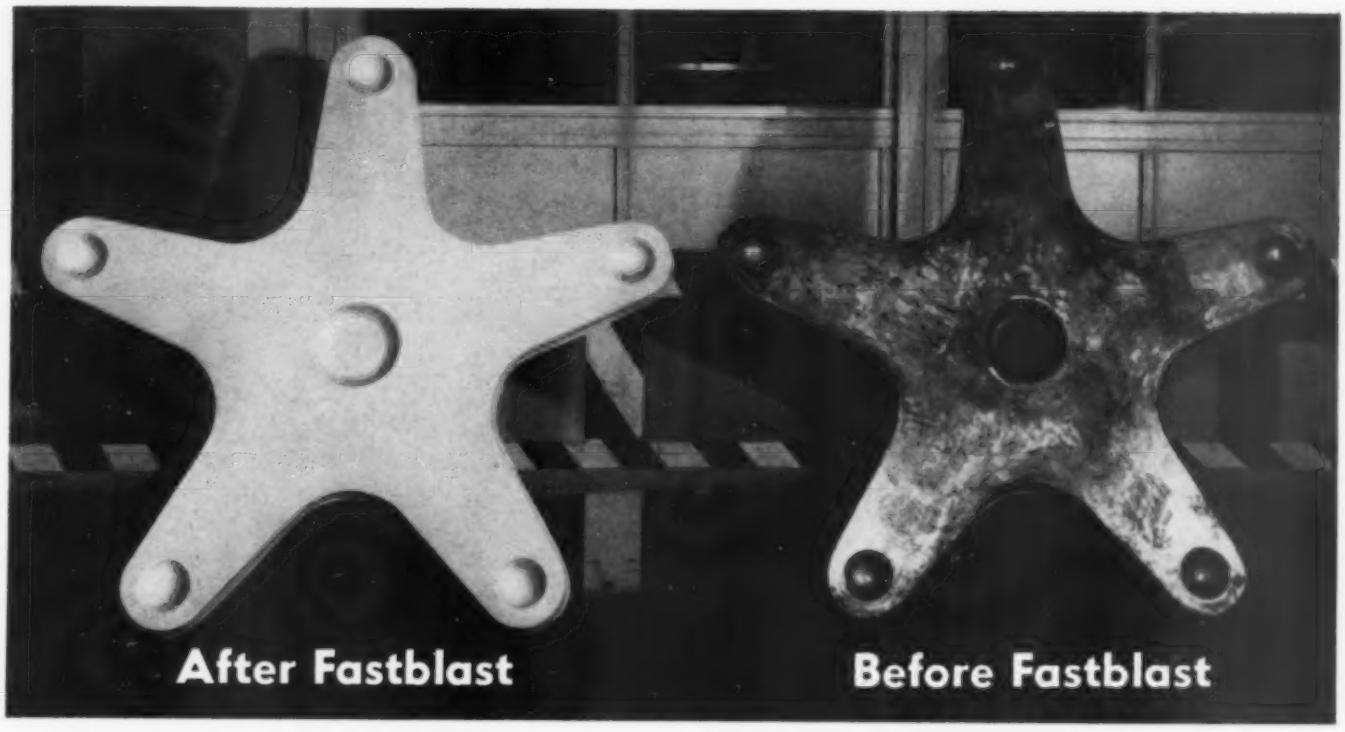
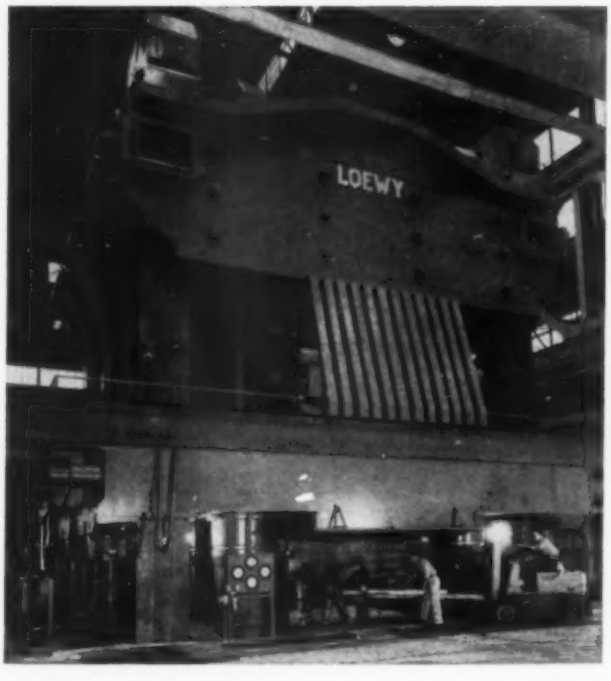
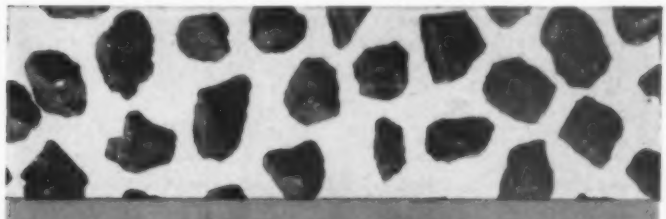



## Wyman-Gordon Company cleans these Helicopter Hub Rotor Magnesium Forgings by pressure blasting with Fastblast




Above: Hub Rotor forgings were produced on this 50,000 ton hydraulic forging press at North Grafton, Mass. plant of Wyman-Gordon — U.S.A.F. It is 10 stories high, 48 feet above and more than 60 feet below the floor.

These large helicopter hubs come out of the forging dies covered with grease and graphite. Air pressure blasting with EXOLON Fastblast, a 100% new aluminum oxide abrasive, quickly cleans them. Fastblast grains are strong, sharp and clean . . . free from weak particles and "lazy" fines and splinters. It's a tough abrasive, that breaks down slowly so that its reclaim value is high. Fastblast can be used over and over again. Fastblast saves time and money. Write for complete information.



Above: Photomicrograph of Fastblast. Shows tough, hard grains that cut faster and last longer.

# The EXOLON Company

1002 East Niagara Street • Tonawanda, N. Y.

**Manufacturers of SILICON CARBIDE and ALUMINUM OXIDE ABRASIVES**

**Industry Observer . . .**

and businessmen that reinforced plastics, more than any other materials, can be modified to meet particular end use requirements. "This is explained," he said, "by the fact that reinforced plastics are composite materials, produced by alloying plastics-resins and reinforcing or strengthening materials. The variables the industry has to work with to product-tailor its materials are not alone the type of resin and reinforcement, but such other factors as the form of the reinforcement, the balance of ingredients and the method of processing."

Many of the new developments in reinforced plastics will be discussed at the 13th Annual Conference of the Reinforced Plastics Division of the Society of the Plastics Industry, Inc., to be held February 4, 5 and 6, 1958 at the Edgewater Beach Hotel in Chicago.

*Preliminary estimates indicate that 1957 was a record-breaking year for steel consumption,* and despite recent cutbacks in steel production, U.S. Steel considers the recent decline in orders as a breathing point in a long-range increase in steel demand. U.S. Steel is backing this confidence in the future economy with nearly $700,000,000 to be spent on authorized projects for additions to and replacement of facilities to keep the corporation prepared to meet anticipated steel requirements of its customers and ready to meet the demands of national emergency.

*Many questions will be answered by the annual survey of Clerical Office Salaries* by the National Office Management Association, 1931 Old York Road, Willow Grove, Pennsylvania. Average salaries for 24 basic clerical jobs in all types and sizes of businesses in 126 Canadian and U.S. cities are covered in the current survey. The largest study of its kind ever undertaken, the survey is based on a sample of over half a million office workers.

Complete results, including trends on paid holidays, overtime, length of workweek, unionization, will be published in booklet form. Copies of the report will be available to non-members this year for the first time.

*A survey of 111 company presidents to find out what kind of decisions they make and how they make them* was taken by Dun's Review and Modern Industry. This survey indicated the biggest decisions in the future would involve expansion, capital expenditures and diversification. Two-thirds of these presidents said their hardest decisions involved people.

In discussing how they reach decisions, the presidents emphasize the importance of getting the facts and "sleeping on" the decision as long as possible. Three out of ten company presidents state flatly that hunch plays no part in their decision-making, and another four out of ten claim it hardly enters in at all. Analytic power and self-confidence in appraising the facts correctly are the executives' greatest strengths in decision-making, according to the survey replies. On the other hand, a number of men report that impatience, haste, dislike of detail, and perfectionism often hamper their decision-making effectiveness.

*Automobile sales*—As 1957 moved to a close, estimates for the final weeks of the year indicated that retail sales of automobiles in the U.S. during 1957 would be slightly higher than the 1956 total of 5,955,000. This would make it the industry's third best sales year—clearly demonstrating once again the importance of automotive transportation in this country.

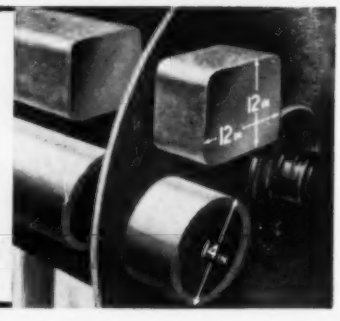
Chrysler Corp. also had its third


Campbell
Abrasive Cutting Machines

**Abrasive Cutting Know-How**

**Know-How is just as vital to top performance in abrasive cutting as in any other machine tool operation**

**CAMPBELL MODEL 412**
For fast, quality cuts of mild steel or toughest alloy billets up to 12" x 12" as pictured




**Users of Campbell Abrasive Cutting Machines get Tremendous Savings with Fast, Accurate, Quality Cuts of Mild Steel or Toughest Alloys**

Write us and we will gladly send you helpful information on the working capacities of the 16 models of CAMPBELL Machines and the CAMPBELL Operating Features that explain the outstanding performance of these machines in cutting a wide variety of shapes and sizes of stock—channels...bars and tubing from the smallest to 14" diameter ...plate up to 4" thick and 20 feet long ...billets up to 12" x 12".

CAMPBELL Machine performance is well illustrated by the **Model 412** pictured above. This machine cuts through 12" x 12" billets of mild steel or toughest alloys (even titanium) in the almost unbelievable time of 6 to 10 seconds per square inch...*with quality cuts.*

Here are some of the operating features that account for comparable speed and quality of cuts by CAMPBELL's 10 high speed production models...two of them fully automatic for highest production.

**Oscillation of the Cutting Wheel** to maintain cutting speeds and greatly lengthen wheel life is prescribed by CAMPBELL for all solids cuts over 2" in diameter.

**Wet Cutting** gives maximum assurance of Quality Cuts.

**Ample Power,** essential to good performance, is supplied for the Model 412 by a 40 HP motor.

**Sound Work Holders**—essential to accuracy.

For greatest abrasive cutting accuracy, CAMPBELL provides two oscillating machines that rotate the work—round bars or tubing from 3" to 14" diameter.

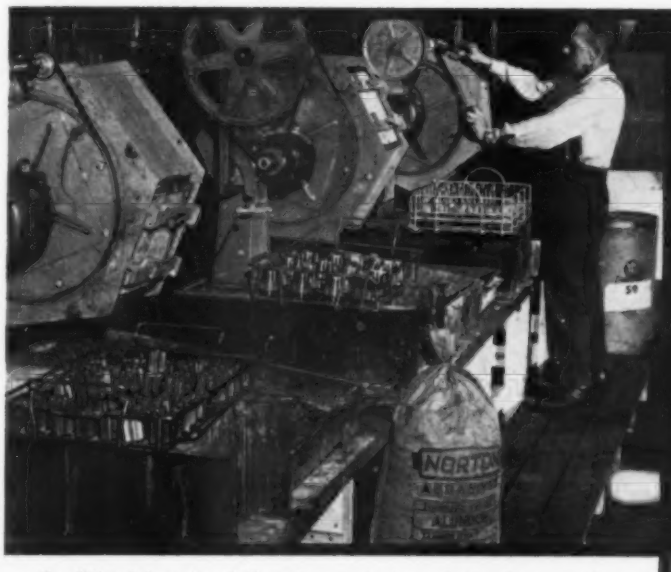
*For further information write for the illustrated Bulletin DH-460-B*

ACCO

**Campbell Machine Division • AMERICAN CHAIN & CABLE**

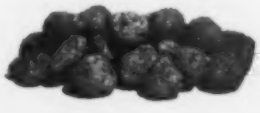
926 Connecticut Avenue, Bridgeport 2, Connecticut

# Money savers for all barrel finishing jobs



Small bench barrels with 7 cu. ft. capacity in production line operation. Alundum Tumblex "T" Abrasive is used for finishing irregular shapes.

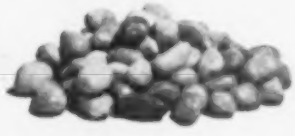
A 4 cu. ft. capacity production barrel being unloaded after finishing operation. Thirteen cu. ft. production barrel shown in left background.



**ALUNDUM* TUMBLEX "A" Abrasive.** For general barrel-finishing. Removes flash, scale, tool marks and burrs, while forming radii and finishes to required micro-inches. Seventeen sizes.

**ALUNDUM TUMBLEX "T" Abrasive.** Bonded, triangular and fast-cutting for special shaped parts. They won't wedge in work slots or holes. Four sizes.

**ALUNDUM TUMBLEX "S" Abrasive.** Bonded spheres that get into areas where other shapes can't reach. Exceptionally dense and long lasting. Five sizes.



**TUMBLEX "N" Abrasive.** Natural stones, exclusively Norton. For high lustre, especially on die castings and soft metal. Rounded shape brings up highest lustre. Seven sizes.

## *For finishing any part . . . in any barrel, large or small . . . there's an exactly right type and size of Norton TUMBLEX* abrasive*

For lower costs in deburring, descaling and finishing parts to close tolerances, be sure to choose:

- *The right barrel equipment, available in a wide range of types and sizes.*
- *The right Norton TUMBLEX abrasive — made in four entirely different types, each in many different sizes and each engineered to add the "Touch of Gold" that brings lustre and boosts profits in finishing the widest variety of parts.*

Send samples of parts you finish — large or small, simple or intricate to our Sample Processing Department. We'll barrel finish, return samples, and tell you exactly the methods and abrasives you need to improve product quality and cut costs.

NORTON COMPANY, General Offices, Worcester 6, Mass. Plants and distributors around the world.

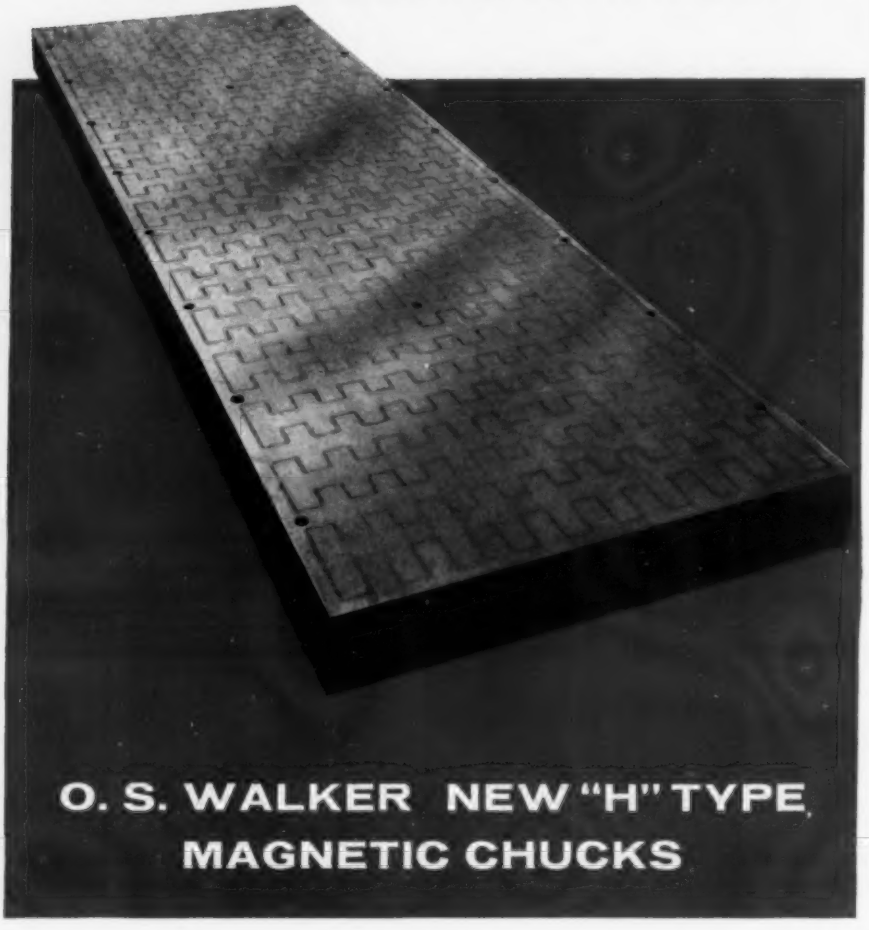
*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

G338

NORTON
ABRASIVES
*Making better products . . . to make your products better*

**NORTON PRODUCTS**
Abrasives • Grinding Wheels • Grinding Machines
Refractories
**BEHR-MANNING DIVISION**
Coated Abrasives • Sharpening Stones
Pressure-Sensitive Tapes

## *For greater* SPEED . . . ECONOMY . . . ACCURACY *in your chucking operations*



O. S. WALKER NEW "H" TYPE MAGNETIC CHUCKS

O. S. Walker "H" Type Electro Magnetic Chucks combine the advantages of both longitudinal and transverse barpole chucks . . . hold parts equally strongly against forces in all directions. Ideal for milling, grinding and layout operations. Eliminates the need of carefully positioning work on the chuck.

SPEED . . . Lay the work on the chuck — turn switch "ON" — start your machinery. Turn switch "OFF" — work is released.

ECONOMY . . . Low first cost is your last cost. You save additional money on clamps, vises, fixtures, etc., required by other methods. The "H" type is also ideal as a layout and gaging table.

ACCURACY . . . These chucks reproduce the accuracy of your machine *exactly!* They are often used in tandem, the gap between the chucks being used as a convenient gaging station.

O. S. Walker chucks are available in a wide range of sizes and types. Permanent Magnetic, Electro Magnetic, Rectangular, Swiveling, Rotary, Vertical.

*Made by the original designers and builders of magnetic chucks.* Send today for our new comprehensive Catalog No. 58, which gives detailed descriptions and specifications of the entire O. S. Walker line.

**O. S. WALKER COMPANY, INC.**
**WORCESTER 6, MASSACHUSETTS, U. S. A.**


### Industry Observer . . .

best year. Estimates indicate that retail sales of their passenger cars in 1957 would total about 1,130,000—nearly 208,000 more units than were sold by them in 1956.

Another good year is looked for by the automobile industry. Automotive advances now being offered to the public, the kind of product promotion being carried on by automobile manufacturers through national and local advertising, and the vigorous merchandising campaigns being conducted by dealers all add up to a good marketing impact.

In the economy generally, there are signs of strength that could make for a good business year in 1958. Home construction and improvements are expected to rise moderately, and over-all business construction promises to hold steady. Local and state budgets for construction of public buildings and highways are higher for 1958. While no signs have yet appeared that appreciable increases in federal defense expenditures are likely in the first half of 1958, leaders in both executive and legislative branches of the federal government have pointed to the prospect of larger expenditures some time during the year. To a considerable degree, the continued high level of activity in non-durable goods and in services has helped offset slower rates of production of capital goods and durable goods. Consumer spending is high.

---

*The nation's first atomic power station* at Shippingport, Pa., is now producing electric power for use in greater Pittsburgh homes and industry. Westinghouse Electric Corp., under contract with the Atomic Energy Commission, designed and constructed the nuclear portion of the plant, and also the turbine-generator. Duquesne Light Co. provided the turbine generating portion and the site, and is operating the plant for the AEC. Included in the nuclear portion are the reactor, canned motor pumps and valves, and other associated components. At full power, the plant can produce a minimum of 60,000 kilowatts of electricity for the Duquesne Light system. • • •

SIMONDS
ABRASIVE CO.

# NEW SA Borolon®
TRADE MARK

## Grinding Wheels

*Ideal for tool and cutter grinding and horizontal surface grinding.*

## COOL ACTION HELPS TOOL STEELS HOLD THEIR TEMPER

SA Borolon is a unique and radically different aluminum oxide abrasive. Cutting particles are of single, uncrushed crystal formation for greater stress-free cutting edges. This is why these wheels give faster grinding with heavier cuts—and, at the same time, protect expensive tool steels with safe, non-burning action. Use SA Borolon wheels on your grinders.

Send for bulletin ESA 272 for details plus grain and grade specifications.

INDUSTRIAL DISTRIBUTORS
SERVING INDUSTRY ECONOMICALLY
THE RIGHT HAND OF PRODUCTION

CALL YOUR SIMONDS DISTRIBUTOR

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**D**ependable know-how
**Q**uick supply

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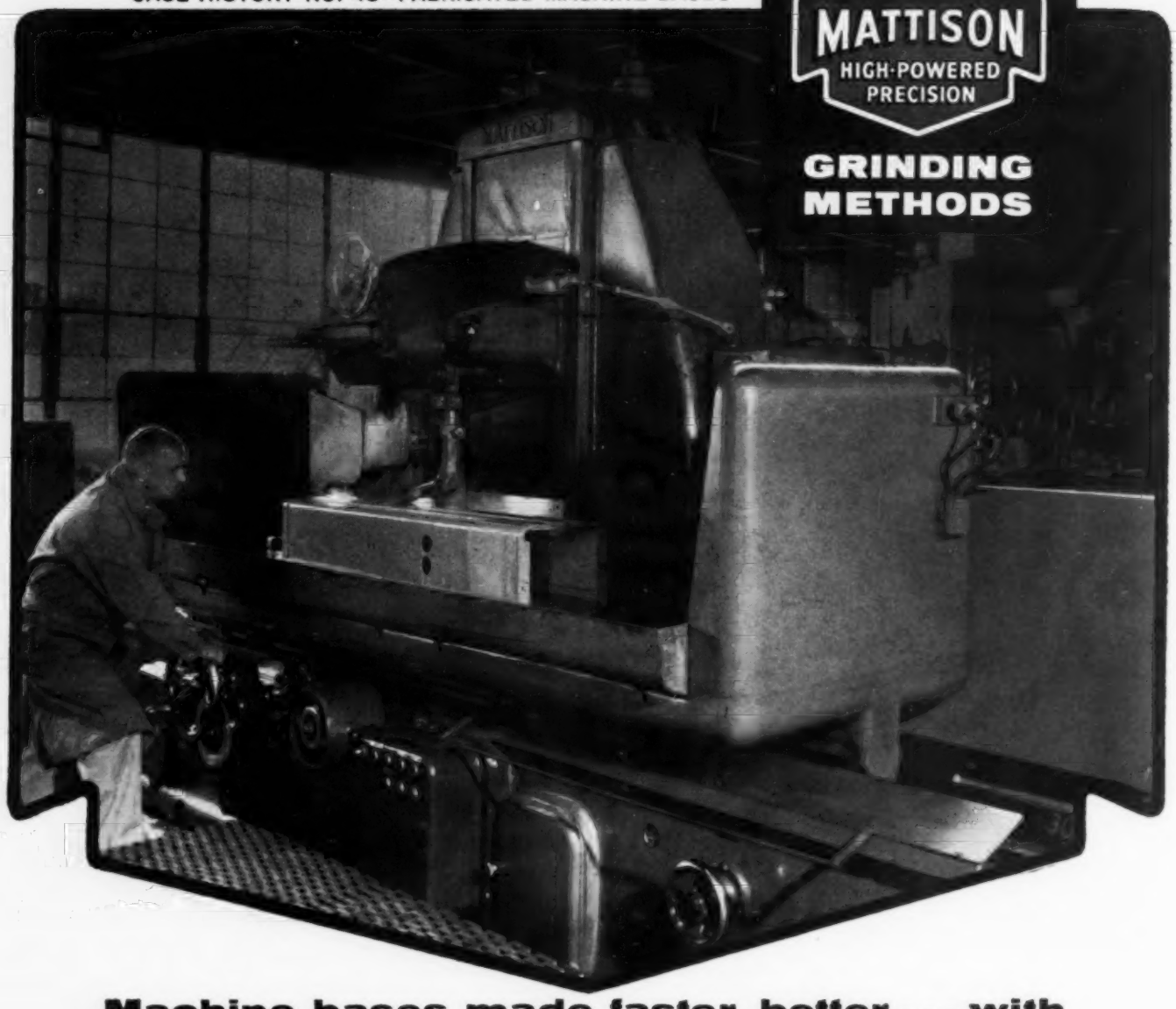
CASE HISTORY NO. 43—FABRICATED MACHINE BASES

MATTISON
HIGH-POWERED PRECISION
GRINDING METHODS



# Machine bases made faster, better . . . with switch to steel fabrication and surface grinding!

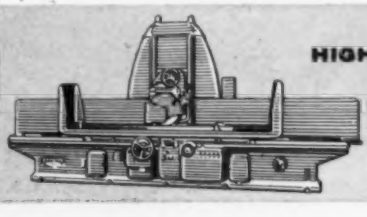
"Following the installation of our Mattison surface grinder two years ago, we were able to accelerate production by 100%, improve accuracy, reduce wheel dressing by 700%, facilitate assembly, maintain consistently better finish, increase wheel width, achieve positive cooling, eliminate chatter, and retain our tool quality without price increases to our customers," says Mr. Herman Goldberg, president of the Snow Manufacturing Company, Bellwood, Illinois.

Installation of the grinder was part of a program which involved switching from cast iron to fabricated steel machine bases and replacement of milling with surface grinding. Now, this company is converted to steel fabrication and precision grinding in 98% of its machine construction, with improvements in productivity and quality.

Vitally important to precision of this company's line of single- and multiple-spindle precision drilling and tapping machines is accurate machining of the 59-inch-long channels on the vertical main frames shown at the right. All surfaces on the frames are now ground on the Mattison to limits of plus or minus .005 in., and flatness is held to .0015 in. over the entire length of the channels. Vise jaws for fixtures are held to within .0003 in., and parallelism of dovetail assemblies is held to .0005 in. over a 38-inch length.

Flatness of 59-inch-long channels is held to .0015-inch over entire length.

MATTISON
MACHINE WORKS



HIGH-POWERED PRECISION SURFACE GRINDERS

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# HILL GRINDING AND POLISHING MACHINES
# For FINISHING
# Any and All
# FERROUS and NON-FERROUS MATERIALS . . .

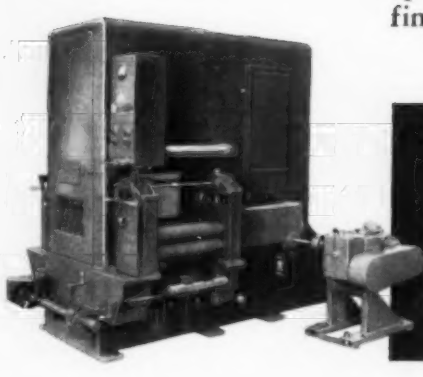
**HILL Polishing Machine**
(Hydraulic Table Type)
For polishing individual sheets and plates. Hydraulic reciprocating table with centralized controls.

FLAT surfaces of ferrous or non-ferrous material can be brought quickly to the high finish so necessary for today's industrial and consumer products. The dairy, automotive, home appliance and engraving industries are typical of the wide range of application for these precise, labor saving machines.

HILL abrasive belt grinding and polishing machines are built in two general types. The hydraulic reciprocating table type polished individual sheets and plates. Table widths vary from 36″ to 60″. Table lengths range from 60″ to 240″. The Pinch-Roll type is for progressive line polishing. The HILL two-roll vertical head with endless abrasive belt is the basic principle common to both types.

When writing for information please indicate size and specifications of stock to be finished.

The basic HILL two-roll vertical head with upper steel idler roll and lower rubber covered contact or work roll (both dynamically balanced) over which the endless abrasive belt travels.



**HILL Grinding and Polishing Machine**
(Pinch-roll Type)
For pre-finishing, conditioning and polishing. Used as single units or in multiple units for progressive line polishing in wet or dry operations.

HILL ACME TOOLS FOR INDUSTRY

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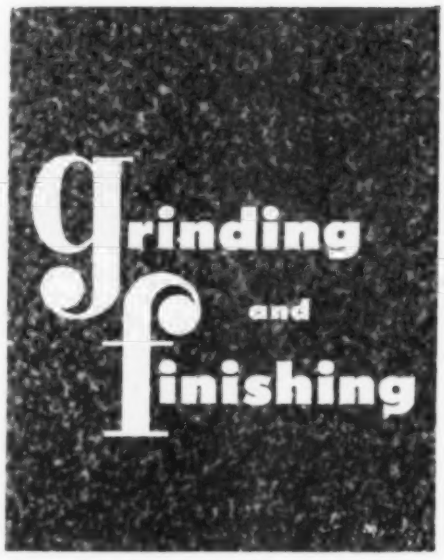



# Editor's Page

## The Rocket Age and Us

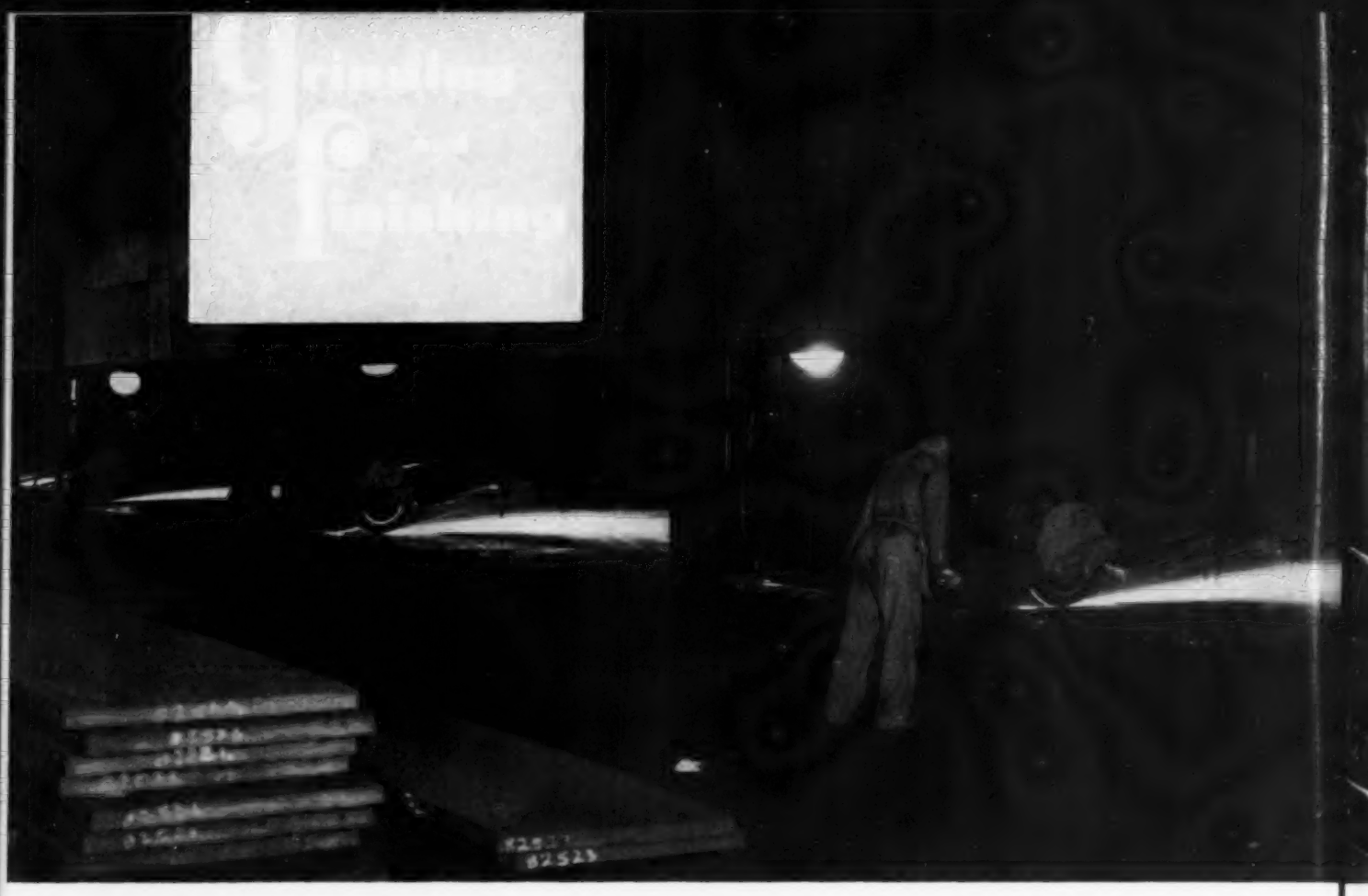
We have all heard a great deal lately about the rocket age and I wonder if we are only listening? Rocket speeds require materials of high strength, high temperature resistance, greater erosion resistance and electrical characteristics which will not impair control of or data collection by the rocket.

The importance of grinding and finishing in the missile development cannot be overlooked. Grinding and finishing operations have been without a doubt the most important factors in the manufacture of rocket components. In this issue of GRINDING and FINISHING we have presented a story of one of the difficult grinding operations required on rocket parts.

A guided missile expert has now been added to the editorial staff. His job will be to bring the latest and most important facts to you. The story in this issue is only the beginning. Many men in the field have been contacted and their stories will be covered by our missile editor in the following issues.

Are we only listening? I hope none of us are!

*M. M. Patterson*
MANAGING EDITOR



*Steel Mill scene showing battery of swing frame grinders snagging stainless steel slabs (Resinoid wheels). The extreme of rough type grinding.*

# The How and Why

By **James Price,** Research Director
Simonds Abrasive Co. and
**Joseph Biglin,** Technical Service Dept.
The Borden Company—Chemical Division

● Abrasive grinding wheels have probably been the single factor most directly responsible for the development of our present automated production methods. Yet, almost all developments of the modern controlled action cutting tool, as we know the grinding wheel, were developed within the last sixty years.

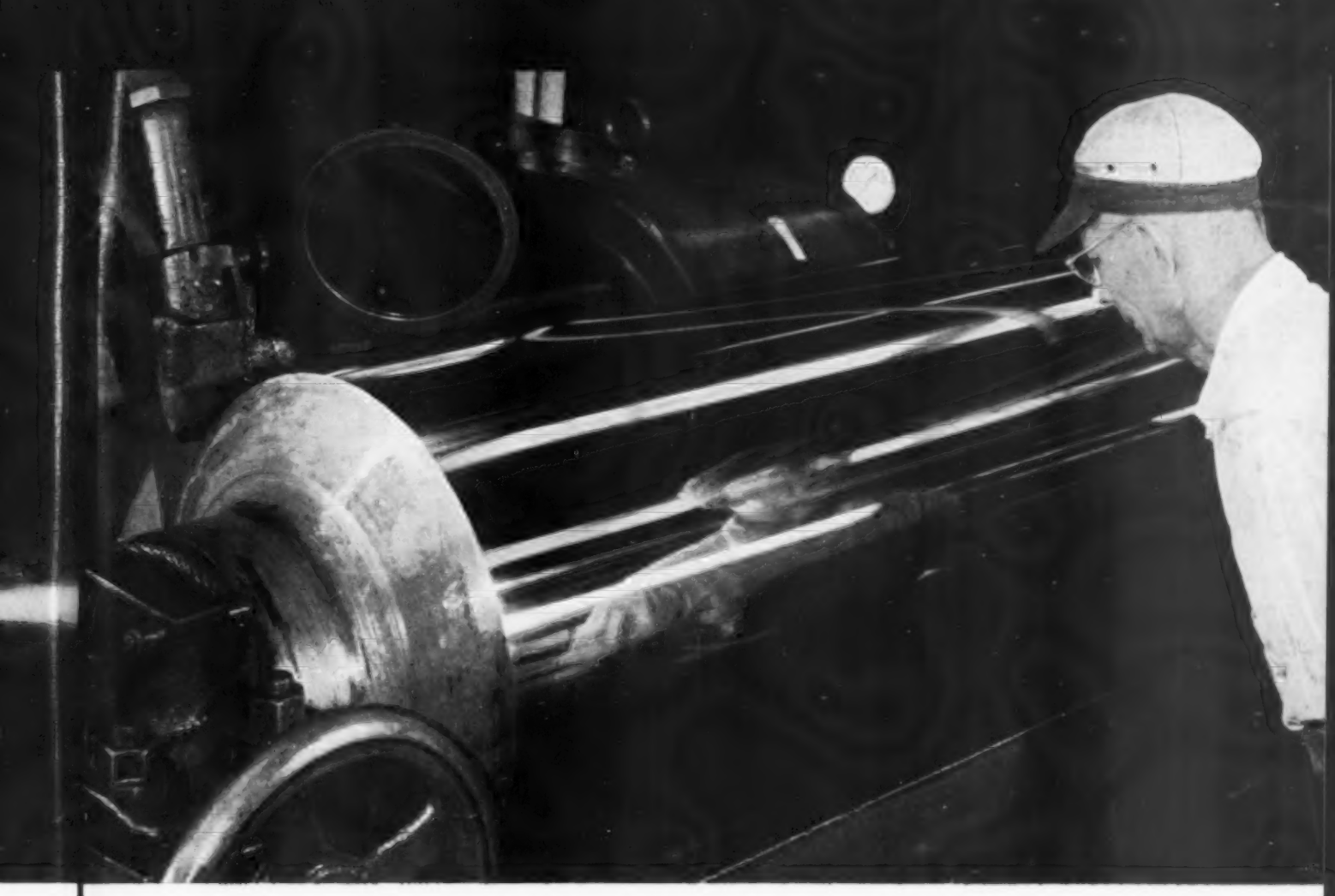
Modern civilization is largely dependent upon the development, and the ability, of grinding wheels to produce in repetition necessary critical parts, such as Jet Engine Blades, and large Diesel Crankshafts, which would not be possible at costs required or to tolerances needed without this method of metal removal.

Our present economy keeps operating to a great extent by the built-in "Fly Wheel" of the automotive industry. In this industry alone it is estimated that each automobile requires over 200 production grinding operations before it emerges on the drive away line. This, mind you, *does not include* the many operations requiring grinding on the basic metals from which these parts are fabricated.

If one examines an abrasive wheel, it becomes evident that it is actually composed of three basic components. Abrasive grits, a binder (sometimes including a filler), and pores or air spaces. The control and arrangements of these three components both as to size, amount, and type, regulate the grinding action of our modern abrasive tools. Therefore, a study of these ingredients will help to present the development of our modern grinding wheel.

*Abrasives*

Nature's most effective abrasive in tonnage use today is corundum still used in certain grinding operations because of its special grinding properties which have not been matched as yet by synthetic or artificial abrasives. This material, basically aluminum oxide, is now principally mined in South Africa. It still holds its place in our modern grinding tool industry, although recent difficulties in obtaining desired grades and amounts may eliminate it as a contender of modern synthetic abrasives.



*Roll grinding finishing operation on steel mill work roll showing high luster possible with this technique. The extreme of finish type grinding.*

# of Abrasive Wheels

Diamond, of course, plays a major part in the grinding industry and is by far the most important of our natural occurring abrasives today. This is due to its unusual hardness and unique grinding properties. Diamonds, originally mined for gem use only, are now of greater significance for their industrial potential due to industry's need for grinding extremely hard materials which in many cases are almost untouchable by conventional abrasives.

Even here our recent trade and technical journals indicate the eventual eclipse of mother nature by new synthetic and artificial materials. The cheapest form of diamonds is used for abrasive wheels but even so a cost of $6,000 a pound is prevalent.

Accuracy, interchangeability, and mass production methods, forced the grinding wheel industry away from natural abrasives toward more controllable, more reproducible synthetic varieties. Synthetic or artificial abrasives today almost completely dominate the field and are basically of two types. Silicon carbide, although later demonstrated to have existed in small quantities in meteorites, was the first purely man made abrasive. This material, a chemical combination of silicon and carbon, is produced in electric resistance furnaces. Silicon carbide originally sold for $880 a pound as a replacement for diamond dust. Today it is a standard grinding material for our hardest materials due to its great hardness—9.5 on the Moh Scale. (It is surpassed only by boron carbide, diamond, and more recently science's newest wonder material—Borazon (boron nitride). Ceramic grinding, particularly glass, tungsten carbide grinding, dresser wheels, and cast iron grinding represent some of the principal areas where silicon carbide plays an important part today. Growth rate of this abrasive shows a 3½ time increase from a tonnage of 29,000 tons between the years 1936 and 1949 alone.

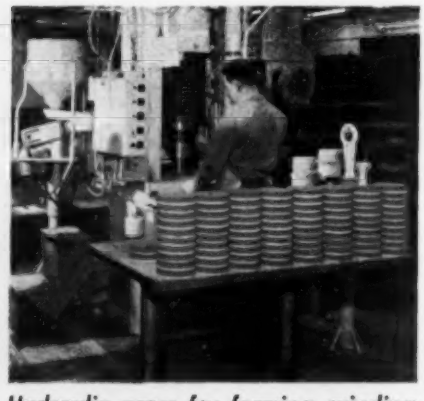
Modern abrasive manufacturers have been able to produce a num-

ber of varieties of this basic abrasive. Today, we have a family of alumina abrasives designed around specific characteristics needed in various industrial grinding applications. Varieties have been made in which basically the chemical composition has been varied over a range from approximately 95 to practically 100% pure aluminum oxide. Recent years have shown the development of the internal crystal structure as an important facet to be controlled for particular grinding characteristics. Thus, we have marketed today fine crystal alumina and another special type produced in such a manner that each individual grit is essentially a single crystal.

Abrasives, in general, have and will be changed in the future by the development of a new concept in the function of an abrasive particle during grinding. Original thoughts were that hardness alone was the primary characteristic for the development of superior abrasives.

Boron carbide was, therefore, considered, a major advance due to its hardness values superior to either silicon carbide or aluminum oxide.

Actual grinding operations, however, did not verify boron carbide as a superior abrasive in many applications in spite of its hardness. Further work indicated a new factor probably best described as attrition resistance to be a major property in the efficiency of an abrasive. This is best illustrated by the fact that it was felt for many years that silicon carbide was more brittle although harder, and that aluminum oxide was tougher although softer than silicon carbide. Test results under carefully controlled conditions developed the fact that silicon carbide was actually tougher than its running mate aluminum oxide. There seemed to be no general relation between hardness, toughness, and end use. Aluminum oxide, although softer than silicon carbide, developed as a much superior wearing tool on high and medium carbon steels, while silicon carbide has shown itself to be better on hard brittle materials, like cast iron and glass, and other materials quite soft in nature—copper, aluminum, and soft bronze.



***Hydraulic press for forming grinding wheels (uncured).***

This property, although not fully understood, is probably connected in some way with the chemical reactions taking place at the high temperatures and pressures existing on the cutting point during its passage through the work. It is believed that perhaps the abrasive tends to dissolve or diffuse into the material being ground. Now, to some extent we can predict the resistance of an abrasive to attritions wear by its capacity to dissolve in the material making up the work piece.

*Bonds*

No abrasive wheel would function without a proper bonding material to hold the individual cutting particles in place until they complete their usefulness and are ejected in favor of a new more efficient cutting point.

The first bond commercially produced in bonded products is conceded to be rubber.

Rubber grinding wheels still play an important factor in our modern industry principally being used in cut-off applications. Rubber, by reason of its strength and flexibility, makes an ideal binder for cut-off applications where side thrust is likely to cause a wheel to be deflected from its original shape. Rubber is still used in areas where high finish is required and it has been found to be the only practical way to produce successful back-up wheels for centerless grinding.

Glue and cement were probably the next materials to be used commercially for bonding grits. This group still remains in existence in the form of oxychloride bonded wheels which are produced from a mixture of oxide and chloride of magnesium. This bond produces a cutting material which can be used without coolants and is still used to some extent in disc grinding where dry grinding is prevalent. The bond is cured cold and requires merely an aging period before it can be used.

Shellac as a binder is essentially a natural occurring thermoplastic (heat softening) resin and possesses unique properties of soft grinding action with high finish which still allows for its use in certain applications today, particularly the cutlery field. Shellac was one of the original bonds used in the early development of the cut-off wheel, but has since been replaced almost entirely by resinoid and rubber.

Silicate bonded wheels utilize water glass as a binder and are made up principally of three components—sodium silicate, fillers, and zinc oxide. The zinc oxide is added to increase the bond resistance to coolant solution. These wheels are used primarily in areas where extremely free cutting and cool grinding characteristics are desirable. Knife and cutlery grinding applications still make use of this bond type. Areas of use for this bond have been steadily decreasing over the years due in part to a control problem within the binder itself.

The two remaining binders used for normal abrasive wheels today are vitrified (essentially glass), and synthetic resins.

Vitrified bonded wheels, although not the earliest in the field, have grown to where they make up greater than 50% of the total wheels now manufactured. This type bond has wide application in almost every field of endeavor with the exception of cut-off. Perhaps it owes its wide application to the fact that the glass binders used can be varied over a wide range of characteristics and compositions to attain desired properties for particular grinding applications.

This bond is characterized by a firing temperatures requirement about 1200° F. and ranging up to 2300° F. Usually they are made of a mixture of clays, fluxes, and frits. Chemical composition is carefully controlled and can vary over a fairly wide range depending on the end use of the product.

One of the major improvements in vitrified bonds over recent years has been the application of frits to vitrified bonds. Frits are actually controlled glasses pre-smelted and re-ground made to careful compositions to add desired properties to the final grinding wheel.

Resinoid bonded products have shown a total growth second only to vitrified bonded grinding wheels in total wheel production. Present trends indicate that we may see the day, not too far in the future, when resinoid bonded products may eventually take first place. Bonds of this type are essentially a synthetic resin or resin combination with or without added fillers as the binder phase to hold the abrasive grit together.

This type bond finds favor where rapid stock removal and extremes of pressure and impact, due to rough usage, are the prime requisites for the wheel in question. Modern trends toward greater production rates plus faster metal removal have thus fostered its growth.

This bond is the youngest member in the accepted types today. While many synthetic resins are known today, grinding wheels use primarily the thermosetting variety, i.e. resins which once cured become hard and permanently infusible. Phenolics for all practical purposes have been the mainstay in the grinding wheel field. They have been the most successful in this field of industrial applications because of their heat resistance.

The phenol formaldehyde condensation products were first developed nearly a half century ago. Since the expiration of the original patents, various companies have gone into the manufacture of this type of resin, with the result that many modifications of the original resins have been developed and applied to the abrasive field.

Two basic materials unite to form this final infusible resinous product: Phenol, a product of coal tar which can also now be produced synthetically, and formaldehyde, a water soluble gas produced by the oxidation of methyl alcohol in the presence of copper or silver catalyst, are the starting materials of this product.

In the manufacture of resin bonded products today, various fillers are also added to supply increased strength, heat resistance, and definite grinding characteristics to the wheel in question. Production techniques also require the presence of various plasticizers, dispersion, and wetting agents necessary to apply the finely ground phenolic resin to the abrasive grits in the mixing operation.

Today, two phenol formaldehyde resin types are used in the preparation of grinding wheels. First the reaction of phenol and formaldehyde in the presence of an alkaline catalyst to produce a liquid resin of the desired solid content and viscosity. This serves to "wet" the abrasive particles. Second, a dry resin also a reaction product of phenol formaldehyde but in the presence of an acid catalyst. This resin is ground to a microscopically fine powder and compounded with a formaldehyde donor, such as hexamethylenetetramine ("hexa"), in an equally fine particle size, all of which harden together during the curing of the wheel.

*Resin Development*

As can be noted from the above, the basic resin type has remained fairly consistent throughout years of use for grinding wheels. However, great changes have occurred in the control mechanisms by which satisfactory products have been manufactured by resin suppliers over these years. Resin manufacturers have gone through a change from crude phenols, produced from natural coal tars, over the same road to synthetic products of more accurate control, as has taken place in the abrasive grains. The use of synthetic phenols by the resin manufacturers has enabled them to insure even higher quality products as the years progress. The equipment used to make these resins has undergone various changes too, including, as is usual in so many chemical industries, more numerous and more accurate instruments of one kind and another to control the process to the final end point. Present resins are being produced in large kettles of much greater capacity, under modern instrumentation, than used initially, thereby maintaining constant controls and uniformity from batch to batch and minimizing the

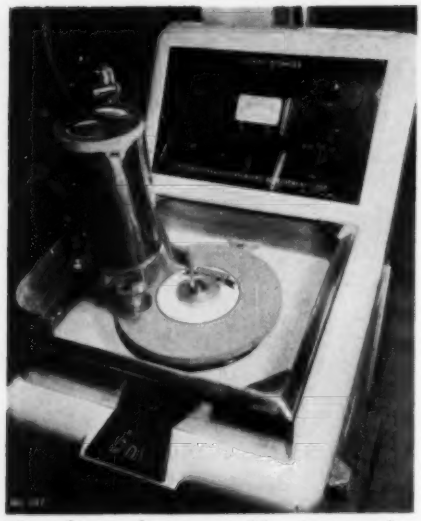
*Continuous oven used for final cure of grinding wheels. A car loaded with grinding wheels, carefully arranged, is shown on the way through.*

number of batches required to produce a given tonnage of resin.

No method of control, however, is of value unless adequate test procedures can be developed to insure that the instruments and automatic controls are functioning properly. The resin manufacturer has also improved his procedures for controlling raw materials and testing them so that now the variation within the end product has been narrowed considerably over the years.

This is not all the story, however, since after the resin is produced it has to be ground and we now know that particle size has a pronounced effect upon the properties of the wheels being produced and must be controlled to very close tolerances in order to produce acceptable final products. Today, the resin manufacturer has improved pulverizing equipment to meet the demand of the grinding wheel manufacturer. Needs were satisfied for a final pulverized product which would allow fast solubility of the resin in the wetting agent to give more complete coverage of the abrasive grain and impart even greater strength to the final cured products.

The proof of any pudding or cake is in the eating and our modern resin manufacturers are today proving out the results of their control tests on the resin itself by final testing with abrasive resin mixtures. Tests of pickup, tensile strength, and flexural strength are made with resin samples by the resin supplier prior to shipment to



*The above shows sensitive test equipment for final inspection of grinding wheels prior to shipment.*

the grinding wheel manufacturer!

Since all resins must melt somewhere in the process of curing both melting point and flow characteristics are known today to be extremely important as far as the grinding wheel manufacturer is concerned. These also are being checked constantly and developments being made to produce special flow characteristics and melting point variations to meet the changes in production methods.

*Fillers*

As mentioned previously fillers have played an important factor in the resin bonded field. The most commonly used filler being cryolite. The story goes that cryolite was introduced merely as a guess or an experiment in attempts to improve strength and grinding characteristics of a wheel with no previous information to indicate it had any possible merit. This material, sodium aluminum fluoride mined in only one area in the world, has become almost the universal filler for grinding wheels over the years, and still is used inconsiderable tonnage.

Recent years have, however, brought information to the grinding wheel manufacturer which would indicate that perhaps grinding properties of the wheel could be improved by the use of materials either as additives or inert fillers essentially which would enhance the grinding characteristics of the wheel by chemically aiding the actually grinding procedures.

*Recent Technological Advances*

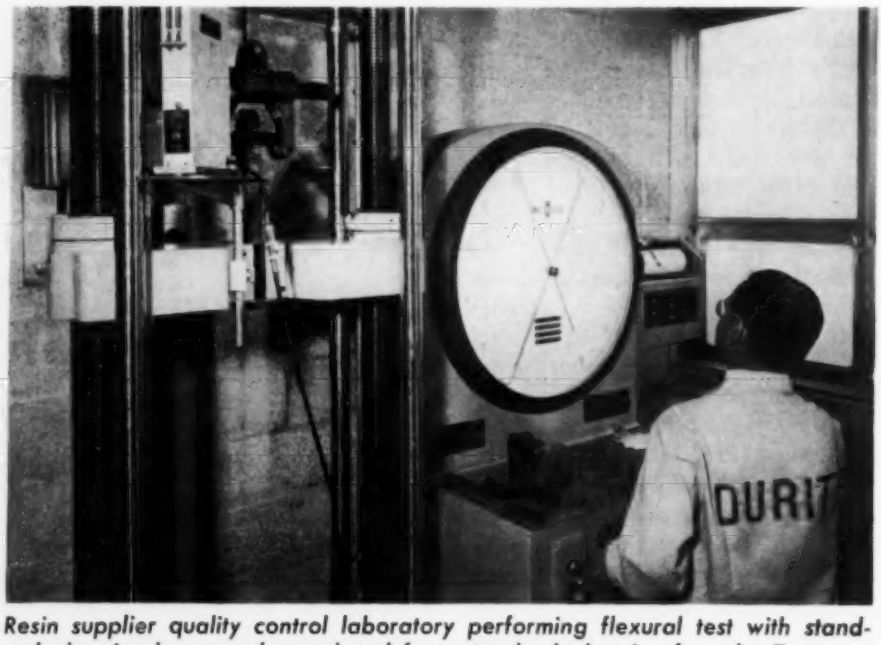
As was noted in previous paragraphs, the wear of the abrasive particles was markedly affected by the pressures, temperatures, and solubility of the abrasive in the work piece. It is easy to conceive, therefore, that any chemical reactions which would inhibit or prevent the development of excess heat by reducing frictional forces between the abrasive particle and the metal work piece might aid in this operation.

Under these conditions, we now see whole new groups of modifiers, being added, containing either sulphur or chlorine which under the temperatures of grinding will be released at the grinding surface to aid in the cutting action of the wheel.

The resin bonded field in particular has been threatened by the possibility that flame cutting methods of one kind or another would have pronounced in-roads if increased cutting speeds could not be developed for grinding wheels. We see, therefore, in recent years the rapid development of automatic high pressure snagging machines whose cutting rates are extremely high and thus restore the grinding wheel to competition again. These machines were actually designed in advance of the actual production of wheels which would take the high pressures and produce the rapid cutting rate desired for these operations. The resin suppliers and grinding wheel manufacturer have cooperated closely to develop the necessary binders for wheels which will be both safe and economical at cutting rates greatly in excess of those accepted as satisfactory in years past.

Wheel manufacturers have instituted finer control of balance and grade through installation of (1) dynamic balancing and (2) sonic testing equipment.

In an effort to meet the demand for faster metal removal other developments in the grinding field have shown that hot pressing techniques might conceivably make possible the use of resins, fillers, and additives in amount and type to obtain higher densities than can be obtained with more common cold pressing procedures. We see today a rapidly expanding area for development in the grinding wheel field for still greater cutting speeds. This writer is certain that both the resin industry and the grinding wheel industry will meet these needs. We shall see even faster cutting, better controlled and necessarily stronger wheels to stand up under the gaff of modern production methods in the steel mills and foundries of this country. • • •




*Resin supplier quality control laboratory performing flexural test with standard abrasive bar sample produced from standard abrasive formula. Test performed by resin supplier for final check of resin properties.*

Photographs—Courtesy Simonds Abrasive Co. and The Borden Company Chemical Division

*Dust collectors mounted on the roof at the Gorham Tool Company.*

## *Saves Floor Space*

# Dust Collector System Installed on Roof

● A few years ago, the Gorham Tool Company of Detroit discarded a large, water-wash dust-collecting system that was occupying approximately 400 square feet of valuable floor space in their grinding room. They replaced it with unit type, single application dust collectors which, while they freed the area previously occupied by the large central system, proved to be no answer to their problem. Individual installations for each machine crowded the room even more than before, resulting in a further loss in efficiency.

Aget Manufacturing Company recommended the roof installation of one model 30 N 50 Dustkop to service six tool and cutter grinders. Gorham's management installed and observed this equipment for a period of one year, after which they contracted for extension of the installation to include the entire grinding room.

Working on groups of from six to twelve machines at a time Aget was able to keep interference with shop operations to a minimum. Four additional model 30 N 50 Dustkops and two model 50 N 70's were all mounted on the flat roof, completely out of the way. They are the binless type, supplied with weatherproof motors, weathertight belts and shaft-covers. Except for occasional motor lubrication, they require no maintenance or servicing. Auxiliary dust-drums connect to the Dustkops by sheet metal pipes and short lengths of flexible hose to allow for easy removal of the lids. These drums are located in non-essential space in corners and against walls.

In addition to saving floor space, there are other important advantages in this type of installation. For example, the power used by the seven collectors is a great deal less than would be required for a single central collector with a motor and fan. When the grinding room is not at peak production, work is assigned to specific groups of machines, and substantial savings are effected by leaving one or more dust collectors inoperative.

In the Gorham plant, as in many others, overhead space is at a premium, and could not accommodate the large main pipe required by a single system. Pipes for the seven Dustkops are small enough so that they could be fitted without disturbing existing power, air and water lines and lighting fixtures.

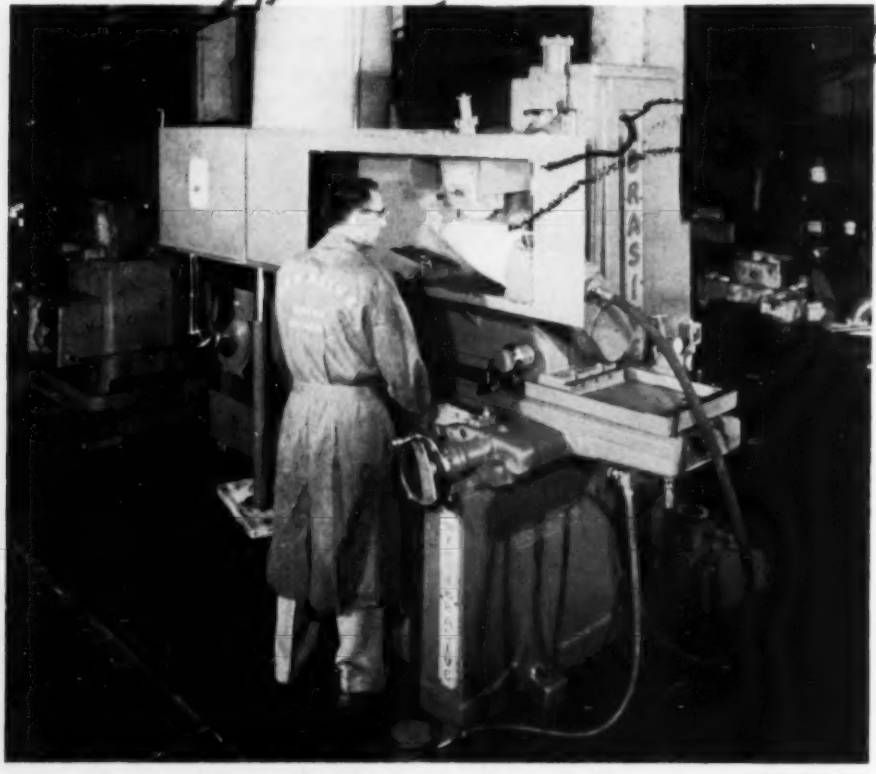
Greater flexibility is possible within the grinding room, since changes which would be difficult and expensive with a single system can be made quite easily. And should the need arise, any or all of the Dustkop systems could be moved to an entirely new location.

This application was completed for about one third less than the estimated cost of installing a large single collector system • • •

*Six to twelve machines are serviced by each dust collector without using valuable floor space.*

*Surface Grinder Used for . . .*

# Grinding Outer Surface of



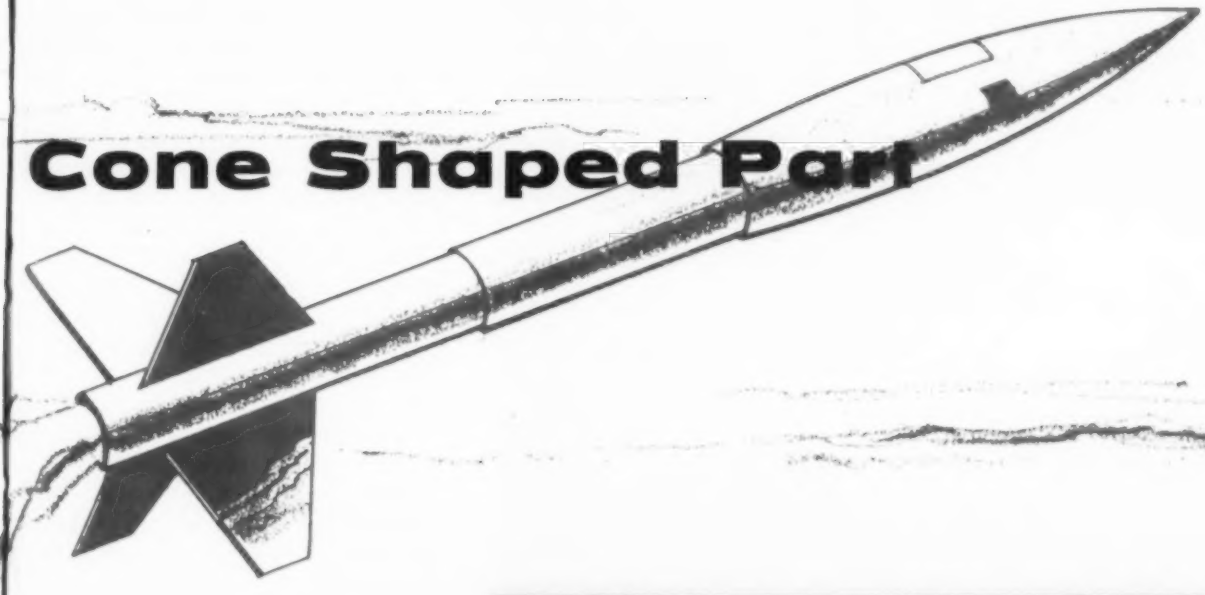
*This surface grinder is grinding the length of a Radome or nose piece of a guided missile. The part is indexed approximately 1200 times per revolution.*

● The construction of guided missiles involves many problems. One which interested the Abrasive Machine Tool Company was the grinding of the Radome or nose piece of such missiles.

These Radomes, more or less bullet shaped, are made of a ceramic material much too abrasive and costly to be machined readily with cutting tools, consequently, it becomes necessary to finish them by grinding. Being hollow and fragile with the contour of the outside varying from the full diameter to practically a point, it was found virtually impossible to turn or grind this outside surface on a conventional type of cylindrical turning or grinding machine.

At the Abrasive Machine Tool Company the idea was conceived

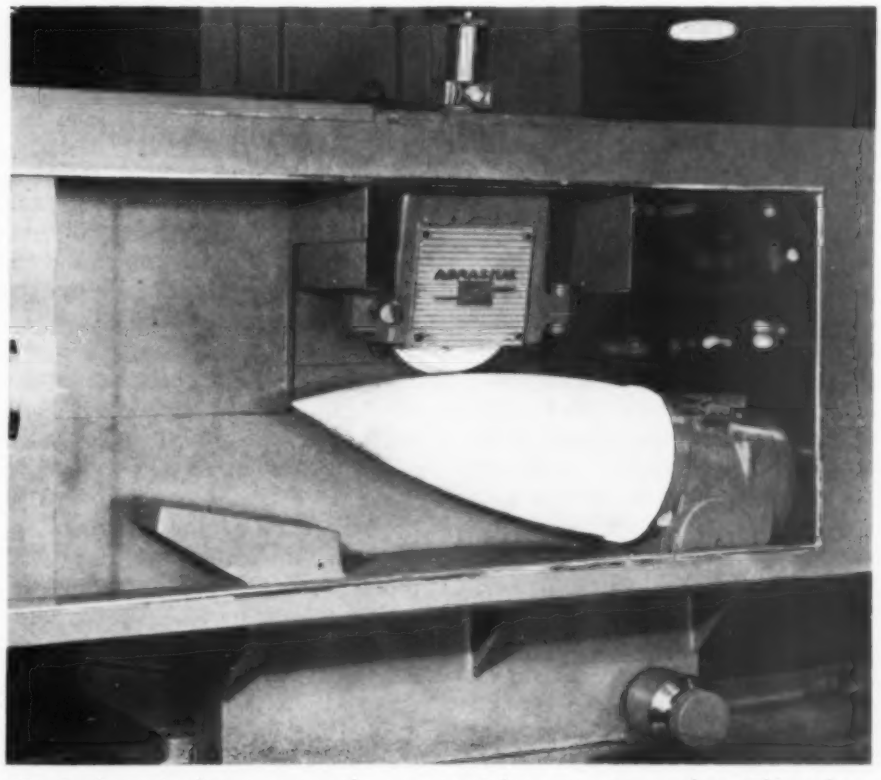
# Cone Shaped Part



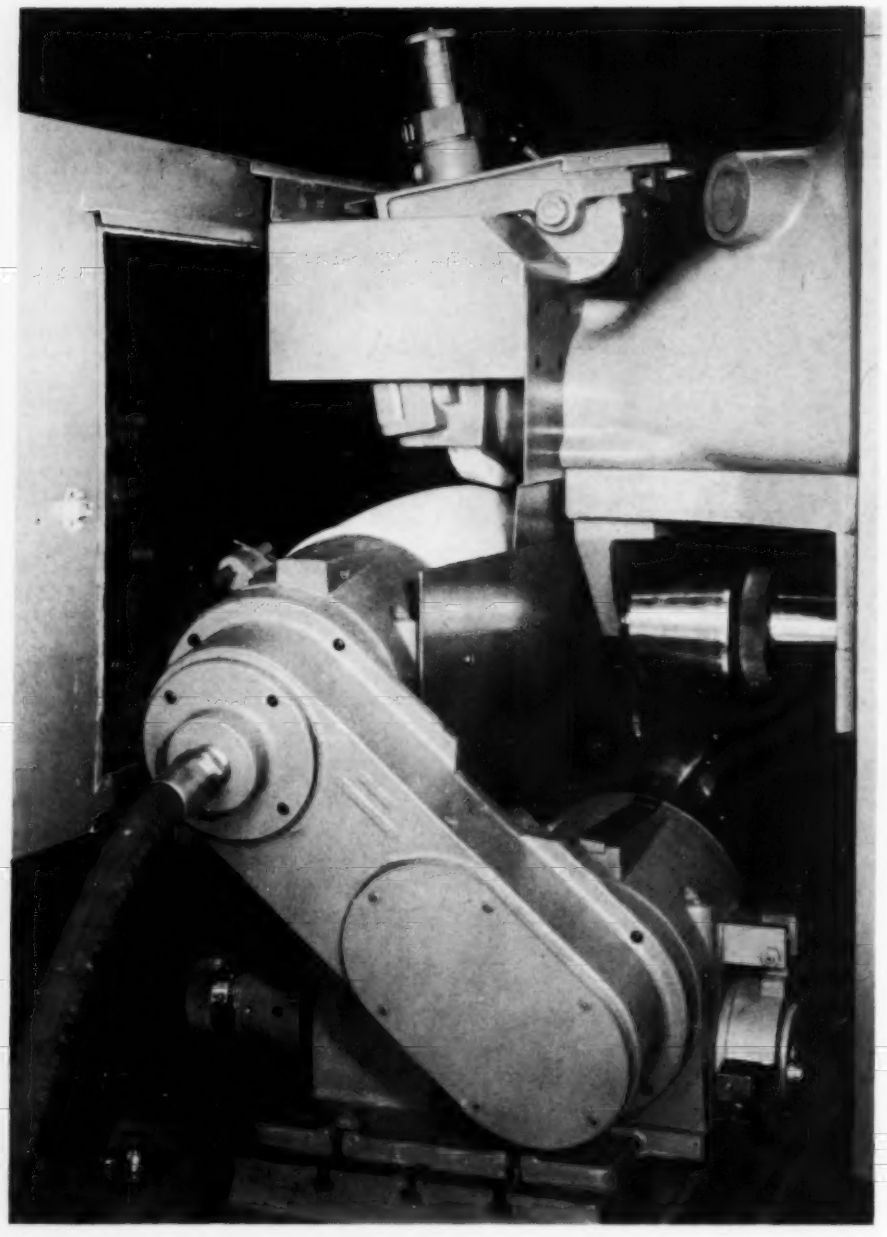
of grinding these Radomes on a horizontal type surface grinding machine with reciprocating table. This sounds very strange but the method has worked out quite satisfactorily.

The Radome was mounted on a special vacuum type arbor made to fit the interior form of the hollow Radome and attached to an indexing head so that the unit would be parallel to the longitudinal table of the surface grinder. (Patents applied for on machine and accessory design features.)

By indexing the Radome approximately 1200 times per revolution the outer surface was ground, in what, at first thought, might appear to be a series of flat surfaces running lengthwise of the Radome.



*The Radome is shown mounted on a special vacuum type arbor. This arbor is in turn attached to an indexing head so that the unit is parallel to the table.*



*Indexing of the workhead containing the master form and the mounted Radome takes place at the end of each stroke. The cam follower is a cone-shaped roller that follows the configuration of the master.*

By simple mathematics and bearing in mind a finish depth of cut of about .010", it was found that these "flats" were really infinitesimal even in theory. In actual operation, due to the tendency of the grinding wheel, size 7" x 1½" x 3", to wear concave and conform itself to the contour of the radome, these theoretical "flats" are practically undetectable and of no consequence. Wheel being used is a C-30-K-15V and is dressed to an angle of 10° 22′ 11".

In order to obtain the proper form on the Radome being ground, it is necessary to have a master of the exact shape and size of the finished Radome mounted on the index head referred to above and indexed at each reversal of the table.

The wheelhead containing the motorized spindle and grinding wheel is mounted in the column of the machine in such a way that it is free to move up and down as it follows the master. An air operated cylinder counter-balances the head so only a small amount of pressure on the cam follower is necessary to move it. The cam follower is a cone-shaped roller on the underside of the head and is mounted in such a position that it can follow the form on the master as it traverses back and forth. The grinding wheel is thus caused to follow the configuration of the master thereby reproducing this controlled form on the surface of the Radome being ground.

Due to the amount of dust produced in grinding these parts (Radomes) dry, it is necessary to provide a complete hood around the table and, of course, an exhaust fan and dust container.

Various other changes on the standard Abrasive 12" x 24" Hydrabrasive Surface Grinder are, of course, necessary. A special wheel truing device is provided with magnified dial to facilitate readings of amount removed from grinding wheel. This amount may then be compensated for with a manual, fine feed, elevating mechanism built into the grinding fixture for accurate size control.

The indexing of workhead containing the master form and the mounted Radome is arranged to take place as the table reaches the end of each stroke.

So successful has this method become that a Radome approximately 8" in diameter and with an overall length of approximately 19½" can be completely ground from rough form in about 23 minutes. Previous methods of finishing these Radome shells required about 14 hours.

Salient points to be remembered in discussing the finishing of the outside surface of these Radomes are many.

One, of course, is that the tolerances are in the order of thousandths of an inch. Wall thickness must be held to that as does run out with master form.

Very important is the finish obtained since the smoother the finish the less turbulence and friction due to the extreme speed of the missile through space.

The foregoing described method of grinding, that is lengthwise of the Radome, leaves a finish where the grain marks of the wheel, if any, are in the direction of flight instead of at right angles to it. • • •

## Toolroom Grinding

# Abrasive Costs on Carbides Cut 40%!

• In its Ivanhoe Rd. plant in Cleveland, Reliance Electric & Engineering Company, large manufacturer of electric motors, grinds just a few short of 70,000 single point carbide tools each year for use in its own shops. Most of these are large tools for heavy machining work. Production engineers, well aware that their carbide tool grinding was becoming a major operation, began to search for new areas where cost saving techniques could be applied. Careful studies indicated that possible cost reductions could be achieved with a methods change.

Further investigation of various alternative grinding processes pointed to electrolytic grinding as probably the most effective available method for reducing abrasive consumption (they had been using "green grit" wheels), a highly important cost factor in grinding the extremely hard carbide tools. Tests and comparisons of results achieved by other users of electrolytic grinding led Reliance to adopt the electrolytic grinding process on April 15th of this year.

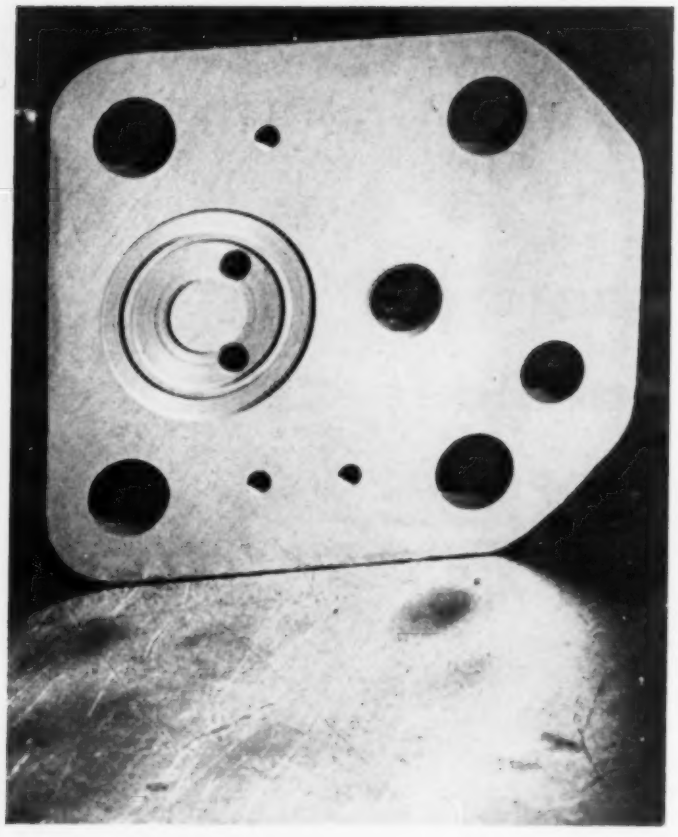
From conventional "green grit" and diamond wheel grinding the company moved to a Hammond Oscillating Head Grinder specially built for use with an Anocut automatic, electronically controlled power unit, the power and control equipment for electrolytic grinding. This 300 ampere control unit renders the metal bonded diamond grinding wheel negative, while the tool is charged positively in the electrolytic circuit.

A coolant (electrolyte) completes the circuit, eliminating as much as 80%–90% of the abrasive action. Thus, the carbide tools are electrolytically decomposed by a cold process which forestalls thermal

variation, heat checks, grinding cracks, etc. The electrolytic decomposition is the reverse of a plating operation. The process is quite unlike the earlier spark-arc process using an oil bath and a series of rapid arc discharges, which required heat build up by resistance.

As soon as possible after the adoption of the process, cost studies were conducted to determine what, if any, savings were gained. Results were significant right away. For each one-thousand tools ground, cost is now $360.00 as against a previous figure of $590.00—a 40% reduction as a result of new equipment installation. Actual carbide grinding costs per year are expected to drop from $41,000 to $25,000 (indirect labor not included). Production is running at a higher rate than before, and the new method has been favorably accepted by the machine operators who appreciate the convenience of having electrolysis handle all but a fraction of the stock removal. Low operational voltage does not endanger the operator even if he should come in contact with the wheel and table at the same time.

Almost daily, new success is achieved with greater experience with this new electrolytic grinding method. As the full potential of the process is realized, Reliance expects to reduce tool maintenance costs down to an even lower figure of half or less from the previous cost per tool. The company points out also that worker efficiency has helped contribute to these low cost figures. Thus, careful investigation by alert engineers has paid handsome dividends to the company through highly significant reductions in carbide grinding costs made possible by conversion to automatic electrolytic grinding • • •



*Shown is the finished seating face of a compressor valve plate. This face was finished on a rotary surface grinder.*

*How Gibson Refrigerator*

## GRINDS AND LAPS IN ONE OPERATION

by **Darrell Ward**
Field Editor

• Gibson Refrigerator Company in Greenville, Michigan, was faced with a problem of producing a micro-inch finish on the seating faces of a compressor valve plate without making a heavy investment in lapping machines. The whole problem was solved by a somewhat unusual application of a Blanchard surface grinder suggested by one of that company's field representatives.

Ed Senn, general foreman at Gibson, was presented the problem of putting the job through on schedule. He said that test lapping was done outside the plant, and finish produced was 4 to 6 micro inch rms but the production rate fell 5% or more below schedule. Lapping machines were considered expensive at best. In this case, they would be doubly expensive because one machine could not produce the volume.

In discussing the problem with a Blanchard representative, Ed learned that it might be possible to obtain a wheel for the Blanchard grinder which would give something close to a 6 to 8 micro-inch rms finish under ideal conditions. That sounded good because the finish would be sufficiently fine to seat the valve to prevent escaping of gas, and there would be no problem with the production capacity of the grinder. This appeared to be a practical idea. There would be no heavy investment for a single purpose machine, merely the cost of the special purpose wheel and the testing for this application.

Tests were made but they were entirely unsuccessful. For one thing, the machine had to be kept abnormally clean to come anywhere near the right finish. And, it seemed too difficult to maintain uniformity. Unseen particles of grit would scratch the surface even when the surface appeared to be mirror-like in quality at first glance. No operator in the shop had been accustomed to working with such super cleanliness on a machine of this kind.

But, persistence in the shop is sometimes a good substitute for an inflated budget. A strong determination to see the thing through in

*Lapping is performed by allowing the wheel of this surface grinder to spark out for five minutes. Cleanliness of the coolant is very important.*

*A mirror-like finish is produced on these parts at a rate of 990 parts in 7 hours. This is some 50 pieces more than could be produced on a special lapping machine.*

this case finally paid better dividends than were expected.

The type 30 gray cast iron parts are first rough ground on a Besly-Welles with a 30" x 2" x 16" wheel of 36 grit and C hardness to remove stock down to approximate thickness.

Then, 164 of these pieces, measuring 2 1/4" x 2 7/16" x .215", are loaded on the table of the Blanchard No. 18 grinder equipped with a Blanchard 220 C 10 wheel run at 700 rpm. The table is rotated at 18 rpm.

Approximately .003" to .005" is taken off on the first plunge, bringing the thickness of the parts to a tolerance of plus-or-minus .002". Parallelism is easily held to plus-or-minus .00025".

After the full cut is taken, the operator leaves the feed adjustment untouched for a period of 5 minutes or so, permitting the wheel to lap the surface of the parts. He notes the surface condition by visual inspection, seeing that visible scratches disappear before the operation is finished.

The problem of cleanliness was solved by disposing of the coolant at the end of each 8 hour shift, allowing about an hour of that period for completely flushing the machine and refilling with new Cimcool solution.

The coolant is a mixture of Cimcool S-2 concentrate with Cimplus water conditioner, one gallon of each to 150 gallons of water. A particular advantage of this coolant, Ed said, is its clarity which permits visual inspection while the grinder is in operation.

With a flood light shining from above directly on the surface of the parts, and a water clear coolant flushing the area under inspection, the operator was quick to point out how easy it is for him to determine just when the parts are lapped to the right finish.

We were already impressed by a production line which consistently produced a mirror-like finish on gray iron castings at the rate of 990 parts in 7 hours. This was some 50-odd pieces more than could be produced on special lapping machines. But, the claim of the operator insisting that he could visually inspect the parts on the rotating table and see when they had reached a 6 to 8 micro-inch rms finish was a little hard to accept.

That is, it was hard to accept until we saw Ed Senn remove one of the valve plates from the grinder and take it to an inspection bench for close examination. *The surface analyser read 2 micro-inch rms consistently,* regardless of where the stylus was placed on the face.

• • •

*A dressing stick is employed to clean the diamond wheel of this cut-off machine, while it runs at normal operating speed.*

*How to*

# Dress Diamond Wheels for Best Performance

by **John W. Ripple**
Abrasive Engineer
Carborundum Company

• This article reviews the dressing and cleaning methods in an attempt to assist shops using diamond wheels to get the most out of their wheels. In grinding with abrasive wheels there is a very close relationship between correct dressing and cleaning of the wheel face on the one hand, and cutting effectiveness and wheel life on the other. This relationship becomes even more apparent, in the case of diamond wheels because of the high wheel costs involved. Because of the significant difference in the characteristics of each, distinctions are drawn according to the type of bond—vitrified, resin or metal.

### Dressing The Diamond Wheel

Dressing diamond wheels involves one or both of the following: removal of surface grits that have become dull through use, and undercutting the bond to expose new sharp points; and cleaning the sludge from the wheel face that has accumulated in the grinding operation. Since it involves a smaller amount of bond removal, the cleaning operation is usually less severe on the wheel.

Excessive dressing—either through the use of the wrong abrasive, or faulty procedure—mate-

*(continued)*

## *Three Different Methods For Dressing DIT Diamond Wheels*

### *Side-Grinding Types Can Be Trued By Machine Grinding or Hand Lapping*

rially shortens wheel life. In order to conserve diamonds, the wheel face must be kept sharp so that the cutting action can be most effective. However, the dressing should not be so severe as to lose good diamonds.

There are three different methods for dressing straight (DIT) type diamond wheels. In the first, the wheel remains on the grinding machine spindle and runs at regular operating speed. The dressing is effected by an abrasive wheel mounted on a toolpost grinder. The axis of this grinder is set at 30° to the axis of the diamond wheel. Light downfeeds are employed and the dressing wheel is traversed along the axis of the diamond wheel until the proper face condition is attained. Grinding should be wet if possible. The 30° angle between the two wheels causes a scrubbing or scuffing action which materially assists the operation. For metal-bonded or vitrified-bonded diamond wheels, a silicon carbide vitrified dressing wheel, 100 grit, M grade, running at a maximum speed of 6000 s.f.p.m. is recommended. The removal of stock from the diamond face should be very slow—about 0.0005 to 0.001 inch per minute. For resin-bonded diamond wheels, an aluminum-oxide vitrified dressing wheel, 100 grit, M grade, should be employed. Surface speed remains the same.

The second truing method consists of supporting the diamond wheel between flanges on the work-centers of a cylindrical, power-driven grinding machine. An abrasive dressing wheel is mounted on the spindle of the machine. With the diamond wheel rotating at approximately 200 s.f.p.m. the table is traversed back and forth. Hand turning of the diamond wheel should be avoided—since the uneven motion will cause flat areas to be ground on the periphery. A silicon carbide vitrified wheel, 100 grit, K grade, is recommended for this purpose. The dressing is done wet using a dressing wheel speed of about 6000 s.f.p.m.

The third method employs a brake-controlled truing device. This consists of a dressing wheel in a small fixture mounted on the machine table below the diamond wheel; it is presented at a 30° angle and the diamond wheel drives the dressing wheel by contact. The dressing wheel is retarded by a brake on the wheel spindle and the scrubbing action which results sharpens the face of the diamond wheel. Here again, recommendations are to use a silicon carbide vitrified dressing wheel, 100 grit, M grade, for metal-bonded or vitrified-bonded diamond wheels; and an aluminum oxide vitrified

*An aluminum oxide dressing stick removes glaze from the resin-bonded diamond wheel of the grinder. A light load can be removed with pumice.*

*Thin, metal-bonded diamond wheels, such as those used on cut-off operations, can be dressed sharp by a short cut through a material like sandstone, limestone, cinder block, or a groggy type refractory brick.*

*A cup wheel is trued by hand-lapping in a figure-eight motion on a cast-iron plate which is covered with loose silicon carbide grain.*

dressing wheel, 100 grit, M grade, for resin-bonded diamond wheels.

The cutting faces of cup, dish and other side-grinding types of diamond wheels—with resin, metal or vitrified bonds—can be trued by machine grinding using the same abrasive wheel recommendations as previously described, or by hand lapping with loose abrasive—a flat, cast iron or glass plate can be used for such operations. A small quantity of 220 grit silicon carbide grain is recommended for lapping wheels in the medium range of grit sizes. Coarser or finer grit sizes may be used for coarser and finer grit wheels. For example, 60-100 grit silicon carbide abrasive grain may be used for diamond wheels 80-180 grit. For diamond wheels 320 grit and finer, 220 grit aluminum oxide grain is recommended, since silicon carbide grain may charge the wheel face and later produce scratches in the work. The lapping operation can be done dry by hand. A figure 8 motion is used and the wheel is given a slight turn after each figure, to maintain parallelism of face and back.

### Cleaning The Diamond Wheel

Load and glaze are usually cleaned from diamond wheels with the dressing stick which is provided with each wheel. Metal-bonded or vitrified-bonded wheels may be cleaned with a silicon carbide vitrified dressing stick, 80 grit, M grade; resinoid bond wheels with a 120 grit, H grade, vitrified stick. The stick is applied manually to the face of the wheel while running at operating speed. Normally, the operation takes from 3 to 10 seconds to restore cutting efficiency, depending upon the bond and the amount of load and glaze to be removed.

Thin, metal-bonded wheels, such as those used on cut-off operations, can be dressed sharp by a short cut through a material like sandstone, limestone, cinder block, or groggy type refractory brick. This type of wheel may also be sharpened with a silicon carbide vitrified dressing stick, 80 grit, M grade. The stick is plunged directly into the periphery of the wheels.

Resin-bonded cut-off wheels can, in many instances, be satisfactorily cleaned with an aluminum oxide vitrified dressing stick, 120 grit, H grade. If the load or glaze is light, plunging block or stick pumice into the wheel will do an effective job.

### Conclusion

Excessive loading or glazing of a diamond wheel indicates improper operating conditions or the use of the wrong wheel. Too frequent dressings may indicate the need for another wheel type or grade. Burning of the wheel face is caused by improper usage or the lack of coolant. Assistance in establishing the proper conditions and the wheel for the job can be obtained by calling for professional engineering help such as provided by wheel manufacturer's abrasive engineering services. Experts in all phases of abrasive wheel applications are available for the asking. • • •

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*Few shops have grinding situations which are "perfect" from a safety standpoint. This operator, working carefully to adjust guide block for tool grinding, and wearing respirator and safety glasses, has large, high speed side-grinding wheel which is not as well guarded as it might be.*

*Depending on fingers alone is not enough for really accurate tool grinding. Particularly with small pieces, there is not only a chance of wiggling the work around and getting the wrong angles, but also some possibility of finger burns. Note wide, heavy-duty work table, adjusted so as to be close to wheel.*

# GRINDING safely

by **Edmund Mottershead,** President
Mottershead Associates, Chicago

• The most common cause of injury in grinding is failure on the part of the operator to wear goggles or face shield. Another major element in injury is wheel breakage, but this, in turn, is generally traceable directly to operator failure to check the condition of the wheel, or to improper storage or handling in some respect, or to improper mounting.

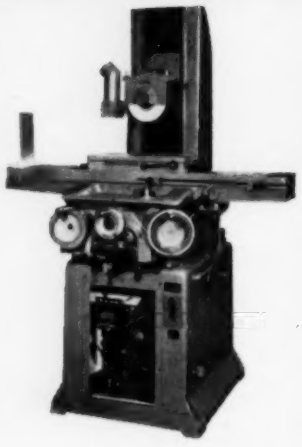
Holding the work incorrectly, or having the work table or work rest improperly adjusted leads to getting either work or fingers or both caught between rest and wheel. Lack of guards on large side-grinding wheels can lead to accidents involving worker's hands getting caught in the open central area of the wheel.

Other causes of grinding accidents are side grinding on wheels not designed for this use, taking too heavy a cut, applying the work too quickly to a cold wheel, using wheel speed in excess of that recommended by the manufacturer, and grinding to high above the center of the wheel.

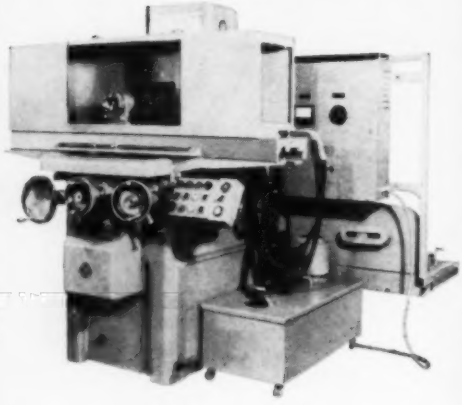
Wheels can be broken from a lack of power as well as in other ways. If a wheel slows down appreciably when work is applied to it, not enough power is reaching the spindle. Check for belt slippage, use of too small a motor. The important point is that, when a wheel slows down, the operator generally puts on more pressure to get his cut and thus sets up dangerous stresses within the wheel.

*WRONG: Holding work away from work rest is a chancy business as far as any accurate grinding is concerned. Work rest is provided so operator can do a better and safer job. The man really should have goggles instead of glasses, also.*

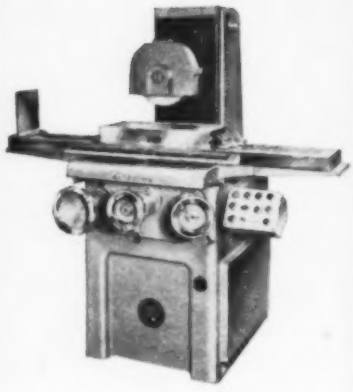
*Dry grinding in toolroom or elsewhere should have an exhaust system, such as is shown here. This experienced toolmaker says that one of the most essential elements in good work and personal safety is having the work being ground fastened down securely in a holding fixture.*



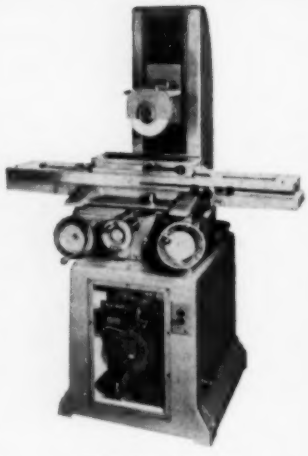
**REID Model 618 P**
Power Table Power Crossfeed



**REID Germanium slicing machine**

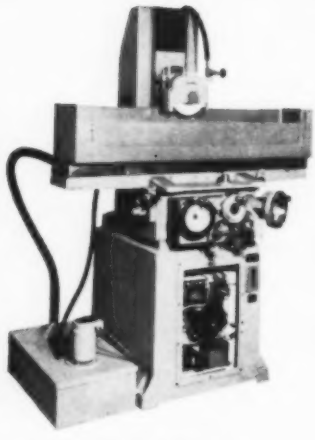


**REID-O-MATIC 824**
All Electric Production and Toolroom precision surface grinder



**REID Model 618 H**
Hand operated (Table and Crossfeed)

**REID Electrolytic surface grinder**



**REID Model 618 PT**
(Power Table Hand Crossfeed shown with wet grinding attachment)

PRECISION SURFACE REID GRINDERS

*Manufacturers of precision surface grinders for production and toolroom needs*

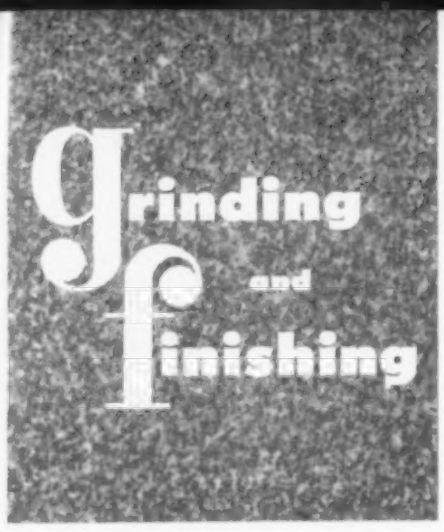
REID Precision Surface Grinders meet a wide range of toolroom and production needs. As proof of this versatility REID Grinders are in everyday use in thousands of leading industrial plants.

Nearly 60 years of manufacturing experience are represented in REID Grinders, and our engineering contributions in this field of precision are a matter of record.

For low cost, dependable performance . . . specify REID . . . the quality Surface Grinder. Available in several sizes . . . write for descriptive literature today.

# REID PRECISION SURFACE GRINDERS

**REID BROTHERS COMPANY, INC. / 134A ELLIOTT ST. / BEVERLY, MASSACHUSETTS**




# Free Literature

Use the postpaid card opposite page 80 to receive your copy of any of the literature listed on these pages. Just circle the proper number on the card and mail it. We'll do the rest.

## Diamond Wheels

The importance of the Pressurelock method of diamond bonding is claimed in the increased holding power of the bond retaining the diamond abrasive particles. Diamond and bond in every diamond grinding wheel is individually weighed and made on a production line basis. Resinoid, metal, and vitrified types of bonds are available.

Diamond wheels made using this method of diamond bonding have produced the lowest cost ratio of cubic inches of carbide removed per dollar of diamond wheel cost, according to the manufacturer.

How to order diamond wheels is given in specifications table of catalog available.

U.S. Diamond Wheel Co., 835 Illinois Ave., Aurora, Ill.

Use postpaid card. Circle No. 1

## Pneumatic Tools

A recent catalog describes the Dotco line of pneumatic tools. It covers the company's line of rotary vane-type, air-driven hand tools for contour finishing and grinding of dies, for finishing molds, patterns, forgings and castings, and for deburring machined parts.

The manufacturer claims the tools are used in aircraft, automotive, appliance, and parts industries. They are available in 5 models.

Doeden Tool Corp., Sherwood, Ohio.

Use postpaid card. Circle No. 2

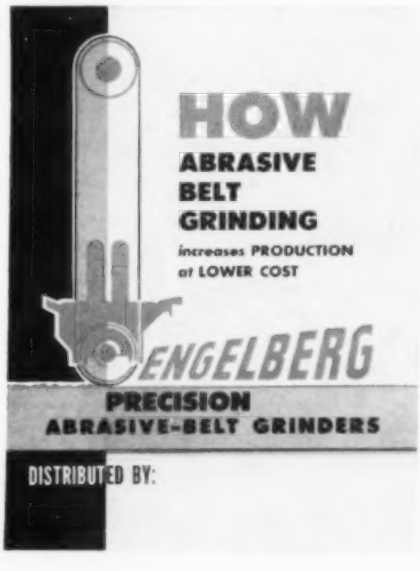
## Abrasive Belt Grinding

"How Abrasive Belt Grinding Increases Production at Lower Cost" is the title of 24-page booklet which contains over thirty illustrated case histories selected after a two-year coast-to-coast survey of Engelberg abrasive belt machine applications. On-the-job data includes production figures, type of belts used, belt life, etc.

Plant installations show how abrasive belt grinders reduce equipment, set-up, material and reject costs; hold tolerances of less than .001 inches, and up production rates by as much as 500% or more.

Engelberg-Huller Co., 831 W. Fayette St., Syracuse, N.Y.

Use postpaid card. Circle No. 3

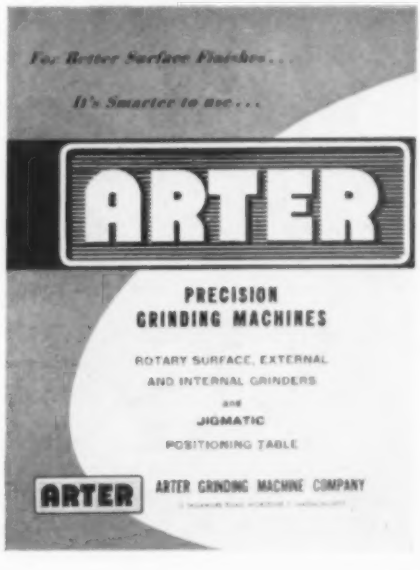



## Precision Grinding Machines

An informative 8-page brochure describes the complete line of Arter precision grinding machines. Illustrated and defined are four models of rotary surface grinders, in chuck sizes from 8″ to 40″, one model of a cylindrical-internal grinder, and the Jigmatic tape-controlled positioning table.

Arter Grinding Machine Co., 44 Sagamore Rd., Worcester 5, Mass.

Use postpaid card. Circle No. 4



## Diamond Cutting Tools

Numerous single stone wheel dressers for standard grinding machines are listed in four-page leaflet available. The faceform dresser, mounted with small natural pointed diamond, is suitable for straight dressing on small wheels. Among the diamonds for gear and thread grinding discussed is the No. 48-4105, mounted with stones securely and concentrically mounted, for Nos. 31, 33 and 35 Excello machines.

A chart is given for selecting correct size diamond for any type wheel.

American Machinery Co., Olivine St., Willimansett, Mass.

Use postpaid card. Circle No. 5

## Lathes, Buffers, Grinders

A series of bulletins features the newest in the Blount models of lathes, buffers, and grinders. The Model F-20″ wet tool grinder has been redesigned to accommodate an adjustable table. Model G combination two wheel wet and dry grinder is for wet grinding edged tools. The base on Model E needs small floor space. Included in all the grinders are the features of Timken tapered roller bearing pillow block with constant oil flow, a combination tool rest and wheel dresser, quickly regulated circulating water system with remote control.

For the chucking lathes, an electric solenoid brake is mounted on rear of spindle for quick stopping, making for a minimum loss of time in loading and unloading parts. Machine can be furnished with magnetic starter and remote push button. Motor driven speed lathes, motor headstock lathes, among others, and lathe attachments, are pictured and defined.

J. G. Blount Co., Everett 49, Mass.

Use postpaid card. Circle No. 6

## Coolant Supply Unit

The Sealol high-pressure coolant supply unit is one of two components designed by the manufacturer to adapt standard drilling equipment for deep-hole and precision drilling, according to Bulletin No. 17A available. This unit, in conjunction with a drill adaptor, comprises the system which delivers micro-clean coolant through the drill at high pressure and in proper volume, directly to the cutting edge of the tool.

Features include controlled pressure, controlled volume, and low maintenance. Described also is a fluid transfer drilling attachment, which is a combination transfer and adaptor which employs a through spindle for attachment to a drill press.

Sealol Corp., Warwick Industrial Park, Providence 5, R.I.

Use postpaid card. Circle No. 7

## Finishing Metal and Plastic Parts

Bulletin No. PC-55 covers processes, compounds, and carriers for tumbling metals and plastics as well as other materials. Tumb-L-Matic manufactures equipment and compounds for both wet and dry process finishing.

The firm's processes are for automatically deburring, cutting, smoothing and lustering . . . or preparing surfaces for plating. All steps are automatic, and in most cases, it is claimed, the final high lustrous finish is obtained without costly polishing and buffing operations.

Tumb-L-Matic, Inc., St. Marys St., Stamford, Conn.

Use postpaid card. Circle No. 8

## Carbide Cutting Tools

Catalog No. 12 shows a complete line of carbide cutting tools, which are ground with a micro-finish edge that gives 10 to 20 times longer cutting life. The super sharp tools cut with less resistance, reducing friction and tool wear, according to the announcement.

Dixie Tool Industries, 4555 W. Franklin Ave., Bridgeport, Mich.

Use postpaid card. Circle No. 9

For the finishing touch
that means so much!
From high-powered automobiles to high-flying jet engine parts, Jewel Brand Coated Abrasives are bringing fast, economical grinding, smoothing and polishing methods to the manufacture of hundreds of precision products. It will pay you to bring their many advantages to bear on your finishing problems. Remember . . . end products cost less when you finish with Jewel Brand Abrasives. Order from your Industrial Distributor or write us for help with special applications.
JEWEL BRAND
COATED ABRASIVES
Belts • Rolls • Sheets • Discs • Specialties
ABRASIVE PRODUCTS, INC.
South Braintree 85, Massachusetts

• GREATER IN PERFORMANCE
• LOWER IN COST

THE NEW *Parker Majestic*

# No. 2 UNIVERSAL GRINDER

## FEATURES:

1 Electromagnetic reversing transmission.

2 Dial type speed selector for wide range of table traverse and work head rotational speeds.

3 100% universal. Capable of grinding angles both up and down.

For many years, Parker-Majestic has manufactured machine tools that have given precision performance at lower cost. This important factor is again to be found in the new Universal Grinder which brings to industry a much wider range of grinding operations.

PARKER · MAJESTIC PM PRECISION MACHINES

PARKER-MAJESTIC, INC. DETROIT 27, MICHIGAN

H○LES

JIG GROUND with

*Vulcanaire*

Provide yourself with this inexpensive* instrument for use on your present equipment and JIG GRIND with a guarantee.

A five station indexing fixture from Vulcan's Contract Tool Room (Your tool room in Dayton).

Using a jig borer index table with the Vulcanaire 5 indexing holes and 35 locating and clamping holes were JIG GROUND in place. Result — eliminated all close locating and dowelling of individual parts and of course hours of time.

*Vulcanaire equipment pays for itself on the first job.

{ Borrow our instructive 11 minute movie on Jig Grinding. }

*Services of your Tool Room in Dayton*

ENGINEERING • PROCESSING • BUILDING • TOOLS • DIES • SPECIAL MACHINES • VULCANAIRE JIG GRINDERS • MOTORIZED ROTARY TABLES BREHM "SHIMMY" AND RELATED DIES • AUTOMATION

*Vulcan's 41st Year*

**VULCAN TOOL COMPANY**
**743 Lorain Ave., Dayton 10, Ohio**

VULCAN tools


## Airless Blast Cleaning Rooms

Rooms varying in size from one capable of handling a six-ton railroad diesel engine weldment to one with a 100-ton capacity used for cleaning castings are described in 12-page catalog, No. 142-D.

There are illustrations of all types of Wheelabrator airless blast cleaning rooms in use for specific cleaning applications. A drawing of the new type M abrasive blast wheel is shown.

Descriptions of spinner hanger cabinets, twin tables, double door swing tables, and swing tables with airblast touchups are included.

Wheelabrator Corp., 1169 S. Byrkit St., Mishawaka, Ind.

Use postpaid card. Circle No. 10

## Coated Abrasives Handbook

"Coated Abrasive," a 36-page handbook, covers information on the technical and trade name data needed in purchasing or selecting abrasive belts, discs, rolls, sheets, etc. Sections on "Storage of Glue Bonded Coated Abrasives" and "How to Order" are helpful.

Clover Mfg. Co., 327 Main St., Norwalk, Conn.

Use postpaid card. Circle No. 11

## Troublefinder for Production Machinery

A four-page booklet highlights the features in the IRD equipment, which is said to provide means to foretell, pinpoint, and isolate trouble in machinery easily and accurately, without the trial and error method. The booklet illustrates how in-place dynamic balancing is performed without dismantling of machinery. The equipment can serve other purposes as production balancing, to eliminate duplication of equipment.

International Research and Development Corp., P.O. Box 55-L, Worthington, Ohio.

Use postpaid card. Circle No. 12

## Tumbling Barrels

Today the Tumb-L-Matic single barrel unit for cutting down, deburring, definning, dry burnishing, and polishing metal parts is accepted for large scale, low cost finishing operations. The type LS employs the dry process. The barrels are described in bulletin No. LS-55.

Tumb-L-Matic, Inc., St. Marys St., Stamford, Conn.

Use postpaid card. Circle No. 13

## Tips on Operating Fork Trucks

An 8-page cartoon-type illustrated brochure gives tips on operating fork lift trucks more safely.

The booklet also serves as a guide in setting up a fork truck driver training course. Topics discussed are selecting operators, classroom instruction, driving instruction and maintenance responsibilities of the trained operator.

Lewis-Shepard Products, Inc., 125 Walnut St., Watertown 72, Mass.

Use postpaid card. Circle No. 14

## Specs. for Abrasive Discs

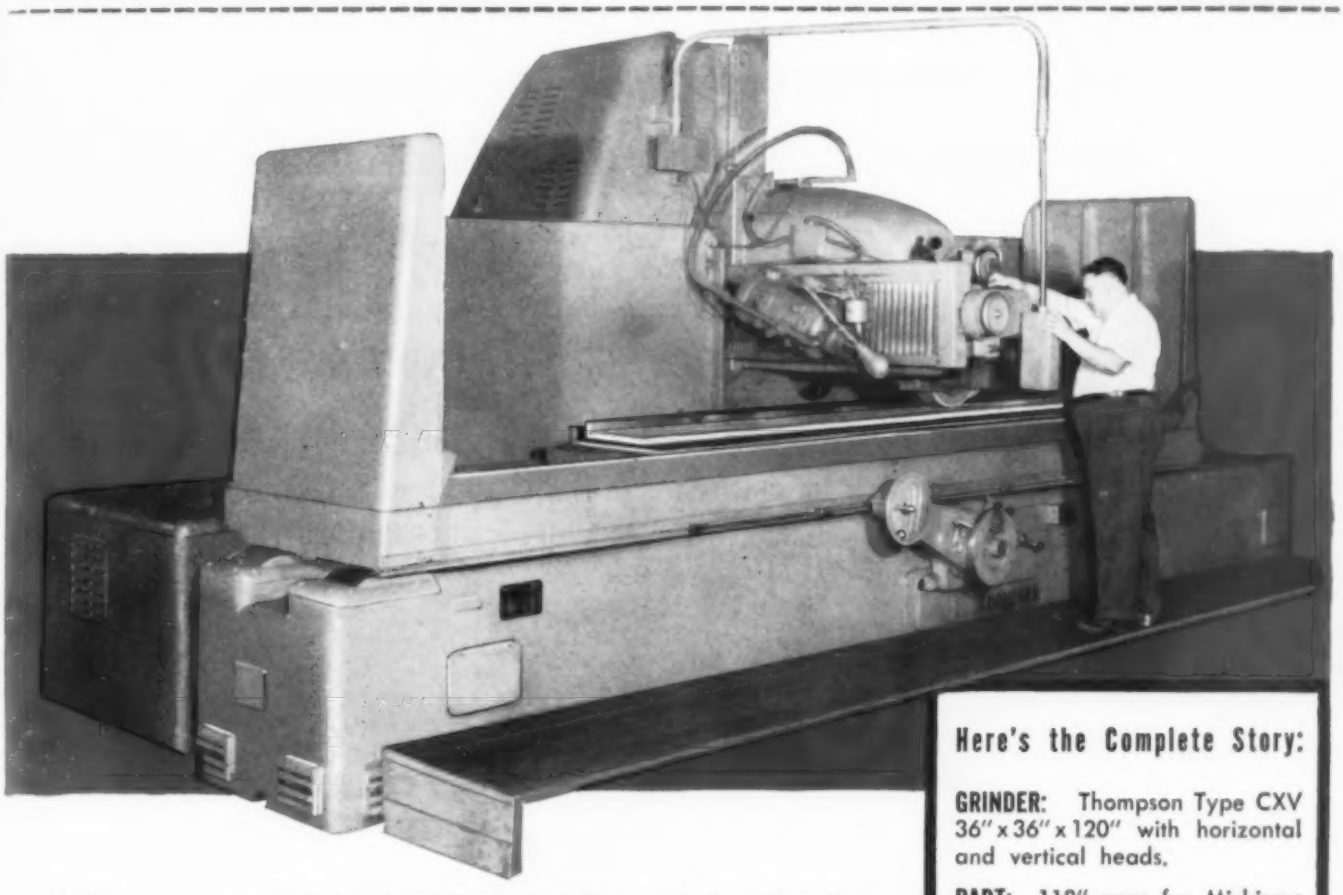
"Machine Mounting Specifications for Abrasive Discs and Plate Mounted Wheels" includes location and size of bolt holes in steel disc wheels, and the mounting side of abrasive discs and plate mounted wheels. Definitions and standard sizes are listed for abrasive discs in the inserted nut, inserted washer, tapped mounting plate types, projecting stud type, and cylindrical type. Plate mounted wheels are also covered in this American Standards Association publication.

Grinding Wheel Institute, 2130 Keith Bldg., Cleveland 15, Ohio.

Use postpaid card. Circle No. 15

# When large parts must be ground to total tolerances of .0005" or less . . . .

# THOMPSON GRINDERS WITH THE NEW HYDRA-COOL HYDRAULIC SYSTEM SOLVE THE PROBLEM!



Machine ways up to 118" for The Michigan Tool Company's Roto-Flo Spline Rollers must be ground to .0005" total tolerance. Heat distortion, caused by hydraulic heat, became a critical problem in achieving this tolerance.

During the three months of operation since the installation of Thompson's new Hydra-Cool Hydraulic System*, these long ways are being ground to consistent .0003"-.0004" total tolerances. Heat distortion is eliminated. Scrap loss is reduced to zero. Grinding time is greatly reduced.

**THOMPSON GRINDERS WITH THE NEW HYDRA-COOL HYDRAULIC SYSTEM MAY BE THE ECONOMICAL SOLUTION TO YOUR GRINDING PROBLEM. WRITE TODAY FOR FULL PARTICULARS.**

Hydra-Cool also offers you these exclusive advantages:

- Heat damage to hydraulic seals, valves, controls and pump is eliminated.
- Break down of additive-type hydraulic oils is prevented—sludge will not form in the Hydra-Cool System.
- Lengthy warm-up periods are eliminated.
- Power costs are greatly reduced.

*Hydra-Cool is standard on all Thompson surface grinders 40 inches and up in work length AT NO EXTRA COST.*

**Here's the Complete Story:**

**GRINDER:** Thompson Type CXV 36" x 36" x 120" with horizontal and vertical heads.

**PART:** 118" way for Michigan Tool Co. Roto-Flo Spline Roller.

**RATE OF TABLE TRAVEL:** 100 ft./Min.

**MATERIAL REMOVED:** .065".

**METAL:** Flame hardened Ductile Iron.

**WHEEL:** 20x4x12 H Grade.

**SCRAP LOSS:** None.

**GRINDING TIME:** 3-4 hrs.

Thompson SURFACE GRINDERS

**THE THOMPSON GRINDER CO., Springfield, Ohio, U. S. A.**

*Pat. Applied For

*"Keep THOMPSON in mind for that daily grind"*

## For greater economy in grinding steel mill rolls specify CORTLAND

# ROLL GRINDING WHEELS

It takes a precision wheel to grind a precision tool and you'll grind your rolls with greatest accuracy using Cortland wheels.

Moreover, Cortland wheels offer long, economical cutting life, with consistent uniformity throughout — reason enough why Cortland Roll Grinding Wheels are specified so widely.

### Specifications?

Here are a few being used in steel mills throughout the country for grinding chilled iron and iron alloy rolls with 20" and 36" diameter wheels...

C20-J-8BC1 C367-N-7BE12
C36-L-8BC4 C36-K-6BQ60
C36-L-7BE

Each is tailor-made to a particular user's requirements — one of these could be just the ticket for you.

**CORTLAND GRINDING WHEELS CORPORATION**

**Chester, Massachusetts**

If you have a grinding problem, there's a Cortland *job-engineered* wheel that will solve it. Let's get together and talk it over.

sR

CORTLAND

FREE LITERATURE *continued*

## Surface Grinders

A comprehensive bulletin on the Hill hydraulic surface grinders is now available. Horizontal spindle, vertical spindle, and extra heavy duty double housing models are included as well as special, precision way grinders. Grinder tables range from 8′ to 40′ in length.

The Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.

Use postpaid card. Circle No. 16

## Protective Products for Industrial Safety

Welsh CR-39 lenses are rugged, light weight plastic, optically correct, and shatterproof with impact resistance equal to acrylic, according to Catalog No. 57 available from the manufacturer. Lenses carrying the WM trademark are said to be free from striae, waves, bubbles, and prisms, and are heat treated for extra toughness, it is claimed. Discussed also are the welding lenses and plates, the metal frame and plastic frame spectacles, eye shields, helmets, among other products designed for maximum comfort, long life, and assured protection in industry.

Welsh Manufacturing Co., 9 Magnolia St., Providence, R.I.

Use postpaid card. Circle No. 17

## Grinding Wheels

Cortland grinding wheels for cylindrical and centerless grinding are described in pamphlet available. For precision grinding for every type of cylindrical work from the huge roll used in a sheet mill to the tiny needle of a hypodermic syringe, the grinding wheel is designed to meet the need for accurate dimension and finish. Included in the brochure are recommendations charts showing material and operation, abrasive, bond, and marking.

Cortland Grinding Wheels Corp., Chester, Mass.

Use postpaid card. Circle No. 18

## Device Measures Surface Roughness

How the Profilometer increases tool life through accurate measurement of tool finish is defined in bulletin LT-6. Longer tool life and improved surface finishes are claimed possible through proper tool sharpening.

Micrometrical Mfg. Co., 345 So. Main St., Ann Arbor, Mich.

Use postpaid card. Circle No. 19

## Finishing and Polishing Machines

The 484 duplex for two operations claims no centering, no chucking, just automatic feeding; 484 single for rapid one-pass finishes. Folder describes how variety of finishes are obtained using abrasive, felt, leather, or fabric belts.

Production Machine Co., Greenfield, Mass.

Use postpaid card. Circle No. 20

## Way Protectors

Bulletin GW-100 describes pliable, way-protection that opens to 90′ on both sides of a tool column and closes to a minimum of 24″. Any width and/or lengths can be supplied to order, with no size limitations.

Primary uses include: milling and boring machines, boring bars, grinders, lathes, and jig borers.

A & A Mfg. Co., Inc., 712 S. 12th St., Milwaukee 4, Wis.

Use postpaid card. Circle No. 21

## Valve Seat Grinding Wheels and Pilots

A 20-page manual for valve seat grinding on 50 different makes and more than 500 model variations of internal combustion engines is now available.

The guide gives directions for reconditioning both soft and hard valve seats, listing recommended sizes of pilots, grinding wheels, or stones for each engine. Included are catalog numbers for the pilots and grinding wheels in the categories of narrowing, rough grinding, and finish grinding of soft and hard valve seats.

Thor Power Tool Co., 175 N. State St., Aurora, Ill.

Use postpaid card. Circle No. 22


**RIBON UNIVERSAL GRINDERS**

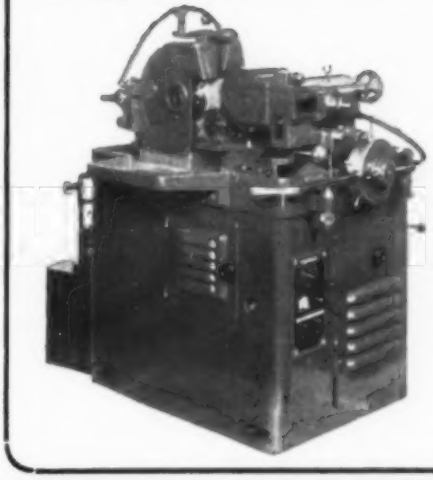
Electro mechanical and hydraulic models produced by one of Europe's largest grinder manufacturers—completely universal with swinging internal grinding heads. 14" x 2" x 5" O.D. wheel with 3 H.P. and 18000 and 35000 I.D. spindles with 1½ H.P. Long conical adjustable plain bearings in both wheelhead and workhead with automatic pressure oil bath lubrication. All machines have automatic table traverse and infeeds.

11" x 20" Electro Mechanical Grinder .... $3600.00
11" x 32" Electro Mechanical Grinder .... $3775.00
11" x 42" Electro Mechanical Grinder .... $3950.00
12" x 20" Hydraulic Plunge Cut Grind... 5430.00

All Prices FOB N.Y. or Chicago

**LOW COST GRINDERS**

*Write for Catalog*



**CENTRI CENTERLESS GRINDERS**

Close tolerance production units capable of .0001" tolerances in production. Long conical adjustable plain bearings on both grinding wheel and feed wheel spindles with pressure oil bath lubrication. Equipped for bar feed, thru feed, and infeed work with automatic ejectors and automatic cycling on infeed where desired. Diamond or crush dressing on both wheels with contour form and taper dressing of wheels by either hand feed screw or hydraulically.

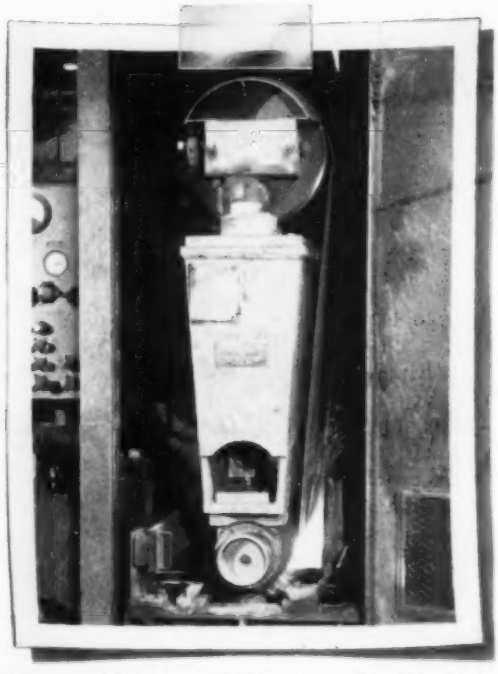
Model 0—Work Dia. .020"-½". 10 x 2¼" x 5" Wheel with 3 H.P. .....$2250.00
Model 1—Work Dia. 020"-2". 12 x 4 x 5" Wheel with 5 or 7½ H.P. .....$3450.00
Model 3—Work Dia. .030"-3". 14 x 7 x 5" Wheel with 16 H.P. .....$5750.00

All Prices FOB N.Y. or Chicago

**THE AMERICAN HERFORDER CORP.**
1801 W. COLUMBIA AVE. CHICAGO, ILLINOIS

*A 3M Case History Report*

# GRINDING PRODUCTION INCREASED 10% WITH 3M ABRASIVE BELTS



**MANUFACTURER:** Houdaille Industries, Inc.

**ADDRESS:** Huntington, W. Virginia

**PRODUCTS MANUFACTURED:** Auto Bumpers

**HOW 3M ABRASIVES ARE USED:** "PRODUCTION" Brand Paper Belts are used to pre-finish hot-rolled steel alloy sheets prior to forming and plating.

**OPERATIONAL DATA ON 3M METHOD:** 3M Paper Belts in grits 80, 100, and 150 are used on a 12-head fully automatic sheet-polishing line. New and used belts are alternated in a specific sequence to get maximum belt life and best finish.

**PROVEN ADVANTAGES OF 3M METHOD:** Customer's own tests established a 10% increase in production using 3M belts. 3M has been selected as major supplier on the basis of this, plus consistent quality and expert engineering assistance provided.

**OTHER 3M ABRASIVE PRODUCTS IN USE:** "TRI-M-ITE" Resin Bond Cloth "PG" Wheels; "Three-M-ite" Resin Bond Cloth Belts, and 3M Type "C" Fibre Discs are used for occasional clean-up and blending operations.

**WANT MORE INFORMATION?** Send for free manual, "Finishing Steel with 3M Coated Abrasives". Write to 3M Co., St. Paul 6, Minn., Dept. IU-28.

"PRODUCTION," "TRI-M-ITE," and "THREE-M-ITE" are registered trademarks of 3M Company, St. Paul 6, Minn. Export: 99 Park Ave., New York. Canada: London, Ontario.

## 3M Coated Abrasives

**"PRODUCTION" PAPER BELTS**

**MINNESOTA MINING AND MANUFACTURING COMPANY**

...WHERE RESEARCH IS THE KEY TO TOMORROW

3M COMPANY

FREE LITERATURE *continued*

## Dust Filters

"Industrial Dust Control" is the title of a 36-page catalog which describes the Sly dust filters, and gives detailed information about dust control systems and how to engineer them.

Defined are the operating principles of the Roll-Clean Dynaclone dust filter. Complete information, capacities, and dimensions are given for intermittent filters for non-continuous applications, and unit and economy filters for use where limited air volumes are to be handled.

W. W. Sly Mfg. Co., Cleveland 1, Ohio.

Use postpaid card. Circle No. 23

## Tumbling Media

An envelope-size folder describing current lines of tumbling media and listing specs. and prices has just been issued. Designed as a vest-pocket reference on tumbling media for superior barrel finishing, the folder gives general applications for aluminum oxide tumbling nuggets, grain and vitrified tumbling pellets.

Electro-Minerals Div., The Carborundum Co., P.O. Box 477, Niagara Falls, N.Y.

Use postpaid card. Circle No. 24

## Fire Detecting—Extinguishing Equipment

A 12-page catalog describes and illustrates portable fire extinguishers, built-in carbon dioxide fire extinguishing systems, smoke detecting systems, and rate-of-rise fire detecting systems. The equipment covered in the booklet is largely for commercial, institutional, or industrial fire hazard applications.

Walter Kidde & Co., Inc., Main St., Belleville 9, N.J.

Use postpaid card. Circle No. 25

"The Tool & Die Makers Surface Grinder"

Harig's NEW TML 6x12 SURFACE GRINDER

THE NEW TML BY HARIG PROVIDES EXTREMELY FAST AND ACCURATE GRINDING—STURDY CONSTRUCTION—ADVANCED DESIGN WITH ECONOMY IN MIND. . . *THE LOW COST WILL PLEASE YOU!*

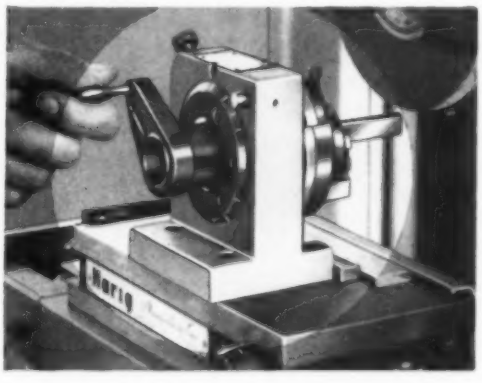
OUTSTANDING FEATURES

- Solid one piece construction of spindle housing and vertical slide.
- Elevating screw centrally mounted.
- Combination "V" and flat ways assure positive alignment.
- Angular rack and pinion mounting distributes wear equally along rack and pinion face.
- Motorized Spindle, dust collector and water unit available.

SPECIFICATIONS

| | |
|---|---|
| Longitudinal Travel | 12-3/8" |
| Cross Feed Travel | 7" |
| Vertical Working Height (Under 7" dia. wheel) | 0" to 12-3/4" |
| Platen Working Area | 6" x 12" |
| Grinding Wheel | 7" x 1/2" x 1-1/4" |
| Elevator Handwheel Graduation | .0005 |
| Cross Feed Handwheel Graduation | .001 |

Remember: Harig's Famous Precision is in Evidence Throughout!



Harig's IMPROVED Grind-All FIXTURE

*"The Latest Advancement in Perforator Grinding"*

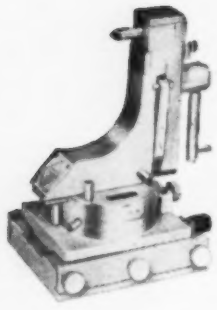
Fast, accurate perforator grinding fixture — hand crank for easy rotation of index plate, single locking screw for making quick set-ups. Easily grinds irregular shaped perforators concentric with shank within ±.0002 accuracy. Also can be used as milling, boring and inspection fixture. NEW! RADIUS DRESSER ARM—attachment makes Grind-All Fixture a highly accurate radius dresser.

made by the house that precision built!

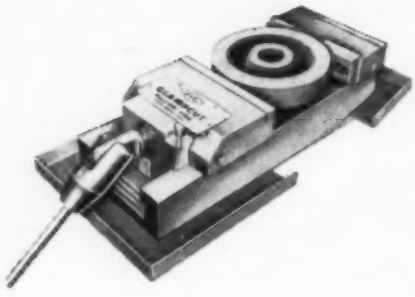
Harig Manufacturing Corp

5769 W. Howard St. - Chicago 31, Ill.

# J&S DOWN-HOLDING DEVICES and WHEEL DRESSERS LEAD THE FIELD

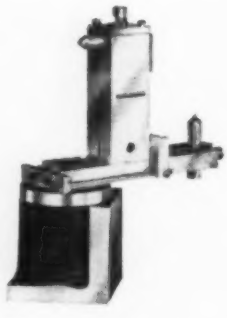


**Fluidmotion Wheel Dressers**—Dress two angles tangent to a radius, using ONE handle in one continuous motion. Operation is so fast and simple that beginners can use them. For all types cylindrical and surface grinders.



**J & S Swivel Vise**—The only hardened and ground swivel vise that mounts low, swivels, needs no pedestal. Patented down-holding clamping jaws give many times the holding power of an ordinary vise, yet only half the weight.

**J & S All-Purpose Jaw Clamps** — For any machine table or face plate. Five models—one adjusting screw has a holding force of 2½ tons on Small model, 12 tons on Jumbo model. Eliminate u-clamps, straps and fingers. No obstruction problems, no interference with measuring tool readings.



**J & S Form-Master**—Sturdy wheel dresser for shops with less frequent wheel dresser requirements. High quality, 100% dust-proof, it is capable of dressing any radii up to 12″ convex, up to 15″ concave.

***Write for free literature and further information.***

J&S TOOL CO. INC. — JAW CLAMPS • PRECISION VISES • DOWN-HOLDING DEVICES — CLAMPCUT

J & S TOOL CO., INC. | 880 DORSA STREET LIVINGSTON, NEW JERSEY


## FREE LITERATURE *continued*

### Centerless Form Grinder

The Model PG-7 centerless form grinder is a precision machine designed to fulfill the need for precise duplication and high speed production of circular formed parts at a low unit cost, according to catalog G-57 available. The machine is said to have the advantages of easy set-up and operation, the working of a variety of basic raw materials, and handling stock sizes up to 5″ in diameter. Some circular formed parts the machine can grind are balls, spools, bobbins, insulators, rings, among other items.

The model is being used with materials as cork, carbon, wood, hard rubber, ceramics, plastics, glass, carbide and powdered metals.

Illustrations, diagrams, and specs. are included.

Glebar Co., Commerce St., Franklin Lakes, N.J.

Use postpaid card. Circle No. 26

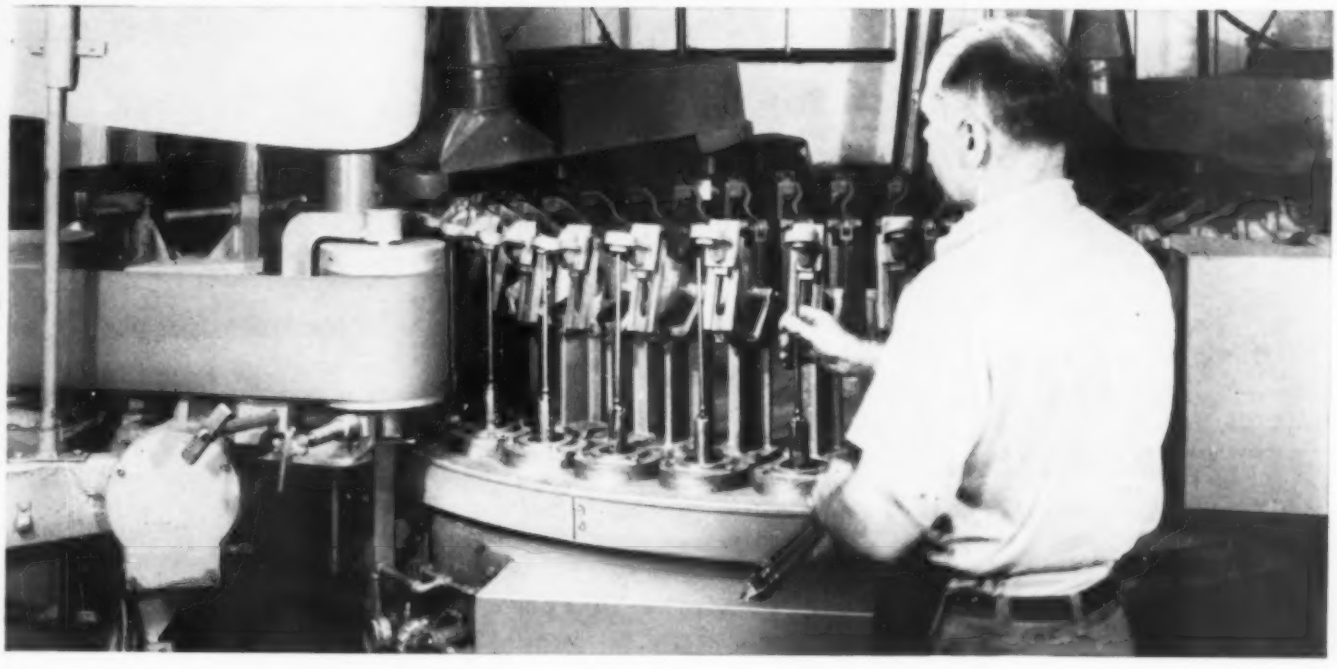
### Grind-All Fixture

Designed to attain high accuracy, greater range, and maximum speed in grinding perforators, light milling and boring, and radius dressing is the Harig's grind-all fixture as described in a recent brochure. Photos show the various irregular shapes which can be ground. Also shown is the newly-designed hand crank for easy rotation of the index plate, and the single locking screw for quick V-block adjustments.

Harig Mfg. Corp., 5757 W. Howard St., Chicago 31, Ill.

Use postpaid card. Circle No. 27

# MICHIGAN BELTS Pre-Plate-Polish 1000 Rough Steel Forgings Per Hr.



## MICHIGAN ON-THE-JOB FACTS:

**OPERATION:** Merry-Go-Round (four-head) roughing, finishing and pre-plate-polishing gear shift levers.

**MATERIAL:** 10-38 steel forgings.

**ABRASIVE BELT:** Four MICHIGAN RED COAT A/O metal-working cloth belts.

**LOCATION:** GENERAL PRODUCTS, INC., Jackson, Michigan.

No matter how simple or complex the machine you fit-out with an abrasive belt, it's the *belt* that finishes the piece. That's why General Products, like many others, keep Michigan Abrasive RED COAT Brand belts on the job. They *know* their investment in men and machines depends on the performance of the belts they use to deliver peak production at lowest possible cost . . . to deliver a profit!

Every day, new customers are being amazed at the *additional* production and superior finishes they get by just switching to Michigan RED COAT Brand belts on their existing machines. Michigan belts are *sharper cutting, smoother finishing and more resistant to loading* . . . you will find they deliver new-belt performance far longer than anything you have ever used.

Michigan Abrasive is the fastest growing manufacturer of coated abrasives in the country . . . and no wonder! The proof is in *performance.*

See what the RED COAT Brand of coated abrasives can do for you. Call your Michigan representative or mail coupon for free, complete catalog and representative will call you for an appointment. You will never know if your finishing costs are at rock bottom unless you do!

**MICHIGAN ABRASIVE CO.**

*Manufacturers of "The Humidity-Controlled Abrasive"*

11910 E. 8-MILE ROAD • DETROIT 5, MICHIGAN

*Mail Today*

O.K., give me the dope on Michigan Abrasives!

☐ Send your Catalog ☐ Have representative call.

Name_____

Title_____

Firm_____

Address_____

City_____ Zone_____ State_____

RED COAT BRAND

*Michigan* ® ABRASIVES

## Grinding of High Alloy Materials

Copies are available on "Electrolytic Grinding—High Alloy Materials," a speech given by Lynn A. Williams, president, Anocut Engineering Co., Chicago, before the Metal Removal Seminary of the 1957 SAE Aircraft Production Forum held in Los Angeles.

Mr. Williams' talk deals with grinding problems encountered in grinding of many high alloy materials being used in aircraft production. He groups the problems into three classes: those resulting from heat or cold working; problems caused by tearing the metal apart or, in the case of fragile materials, by not presenting a rigid machining surface; and cutter and tool problems.

Anocut Engineering Co., 631 W. Washington St., Chicago 6, Ill.

Use postpaid card. Circle No. 28

## Mounted Wheels

A new catalog treatment has been given to the subject of abrasive mounted wheels. General information with regard to grinding action, wheel markings, grade, bond types, abrasive types, structure, grain size, spindles, and treatments are discussed. The availability of mounted wheels has been set forth in chart form.

Bay State Abrasive Products Co., Westboro, Mass.

Use postpaid card. Circle No. 29

## Surface Grinder

Three leaflets, put out by Blanchard Machine Co., describe the automatic cycle surface grinder, general purpose surface grinder, and the large surface grinder.

The No. 18-C Blanchard surface grinder is designed for either automatic cycle or manual operation. One cabinet, separate from the grinder, holds all the control units. The No. 11 general purpose grinder is in use by leading makers of tools, precision bearings, aircraft engine, and optical instruments, and has proven successful for the most highly finished and accurate work, it is claimed. For facing the side of gears, collars, and bushings accurately parallel to first side, No. 18 grinder is recommended.

The operation of the larger machines is as follows: The work is placed on the magnetic chuck and switch is closed to energize the chuck. The operator touches table traverse push button, and chuck is traversed by power to the grinding position under the segment wheel. Then the chuck is continuously rotated, the water inside the wheel and outside the wheel is turned on, and wheel head is fed down by hand until desired size is reached. The wheel head is quickly raised by power, and chuck traversed to loading position.

The Blanchard Machine Co., 64 State St., Cambridge 39, Mass.

Use postpaid card. Circle No. 30

## Offhand Belt Finishing Materials Chart

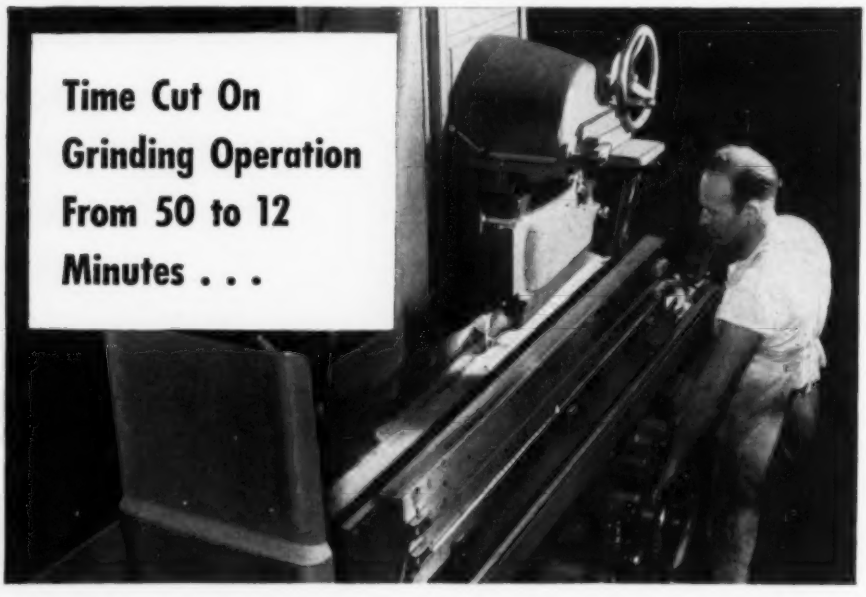
An illustrated wall chart is obtainable which simplifies the selection of offhand belt finishing materials and equipment. Proper abrasives, grit, belt speed, lubricant, and contact wheel are listed for 16 of the most popular metals and alloys.

Eleven types of contact wheels are described. Information includes types of surfaces, hardness and density, wheel action, and the advantages of each type of contact wheel.

The 15" x 27" chart is designed to be hung in tool rooms and work areas.

Behr-Manning Co., Troy, N.Y.

Use postpaid card. Circle No. 31


**With SUNDSTRAND "POWER-GRIP" Magnetic Chuck**

Here's another good example of time savings with Sundstrand Magnetic Chucks. Two airplane flap tracks are held at one time for grinding on opposite faces of rail. Grinding stroke is 70 inches. Former time with conventional holding equipment was 50 minutes. With change to Sundstrand "Power-Grip" Chucks time is cut to 12 minutes . . . a savings of 38 minutes per part.

There's a good chance that you may be able to save considerable time in milling or grinding operations with Sundstrand "Power-Grip" Magnetic Chucks. Call in a Sundstrand Engineer. There is no obligation for this service.

**Free Data** is available on Sundstrand Clamping fixtures. Write today. Ask for bulletin 388-M.

SUNDSTRAND
MAGNETIC POWER-GRIP
SUNDSTRAND
Magnetic - Pneumatic Products
Division of Sundstrand Machine Tool Co.
1020-9th ST. • ROCKFORD, ILLINOIS

## FREE LITERATURE *continued*

### Surfacing Machine

Two operations in a single pass are possible on the twin belt surfacing machine, according to Bulletin F18. It uses opposed abrasive belts as cutting media. Properly tooled, the machine may be used for a wide variety of applications where opposite sides of part require a grinding or finishing operation, it is claimed. Each head is powered by a 1200 rpm motor of 7½ hp developing a belt speed of 3500 sfpm.

Production Machine Co., Greenfield, Mass. **Use postpaid card. Circle No. 32**

### Tumbling Barrels

The type XL barrel, Tumb-L-Matic wet process, is for deburring and cutting down, smoothing and burnishing of forgings, stampings, castings, and other metal parts. For large production of large parts, this type includes perforated flushout doors, separating screens, and unloading pans. Descriptions and specs given in recent folder. Optional equipment available.

Tumb-L-Matic, Inc., St. Mary's St., Stamford, Conn.

**Use postpaid card. Circle No. 33**

### Face Grinders

The traveling-table face grinders are designed for grinding a wide range of work according to folder available. They are used in all kinds of production, tool, and maintenance shops in virtually all industries—metal-working, railroad shops, paper and pulp mills, terra cotta and rubber plants, etc. Folder fully illustrates, describes and gives specs. of machines.

Mattison Machine Works, Rockford, Ill. **Use postpaid card. Circle No. 34**

### Machinery Maintenance

The line of IRD systems to reduce costs on machinery maintenance and quality control is described in pamphlet available. The booklet lists the application possibilities, description and operating ranges of models of vibration meters, vibration analyzers and portable balancers, etc.

International Research and Development Corp., P.O. Box No. 55, Worthington, Ohio.

**Use postpaid card. Circle No. 35**

### Blast Cleaning Machine

A 32-page catalog No. 951-D from The Wheelabrator Corp., 1169 S. Byrkit St., Mishawka, Ind., covers the company's line of airless blast cleaning machines, as well as wet blast, air blast, and dust control equipment. Also included are cast steel shot and grit abrasives, sandcutters, and core rod straighteners.

**Use postpaid card. Circle No. 36**


# DALZEN

## THREAD GRINDER

- **AVERAGE SET-UP TIME 30 MINUTES!**
- **SAVES FLOOR SPACE!**
- **LOW COST!**

Excellent for tool room and production Thread Grinding. Easily set-up from job to job! Has built-in relieving attachment as standard equipment for grinding of taps. This remarkable machine may also be used to grind angles, grooves and surfaces where concentricity is an important factor!

Dresser and wheel head are self-compensating. Size of work is automatically maintained after dressing of wheel regardless of how much is dressed off.

The grinding and regrinding of thread rolls up to 3" in diameter and thread milling cutters can also be ground with special attachment.

Photo shows just a few of the many jobs done on the DALZEN THREAD GRINDER.

## 2 in 1 COMBINATION
### CENTER GRINDER AND DRILL PRESS

A drill press and center lapping machine at less than the cost of many single purpose center grinders! In addition to savings on equipment costs, the Dalzen "2 in 1" permits maximum man-hour production thereby keeping your unit cost at a minimum!

**1 SIMPLE OPERATION CHANGES CENTER GRINDER TO DRILL PRESS**

Center grinder to drill press or drill press to center grinder in a matter of seconds! Simply unlock clamping handle and swing diamond dresser in or out of position! Photo at right shows center grinder at work.

**A full 43" capacity from base to spindle . . . dresser adjustment from 20° to 100° included angle . . . drills to center of 15" circle . . . maximum lapping stone dia. 3".**

WE ALSO SPECIALIZE IN
**THREAD ROLLING DIES AND THREAD HOBS**
**LITERATURE ON REQUEST**

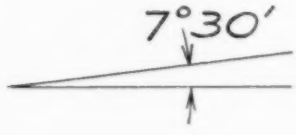
**DALZEN MANUFACTURING CO.**
**4600 BREE ROAD** **DEPT. GF-2**
**ST. CLAIR, MICHIGAN**

This is a knock-out cavity bushing.

It is used in plastic injection molding.

It is manufactured by *FASTEX,*

Division of Illinois Tool Works, Des Plaines, Illinois.

It has a 

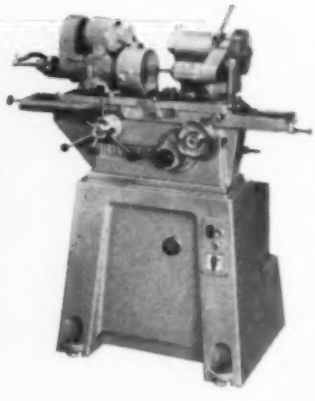
internal taper.

It is ground from hardened tool steel, 58-60 Rockwell C

*The tolerances must be held to* 0.0002"

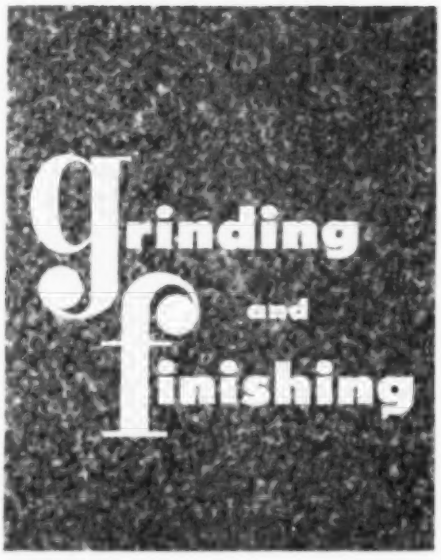
The grinder on which this bushing and all its cousins are made is a

RIVETT
MODEL 84



**Model 84**
An internal specialist with external ability. Mounts interchangeable wheelheads for internal and external spindles. Capacities are 3" diameters, depth 4". Collets and step chucks mount directly in lathe-type spindle.

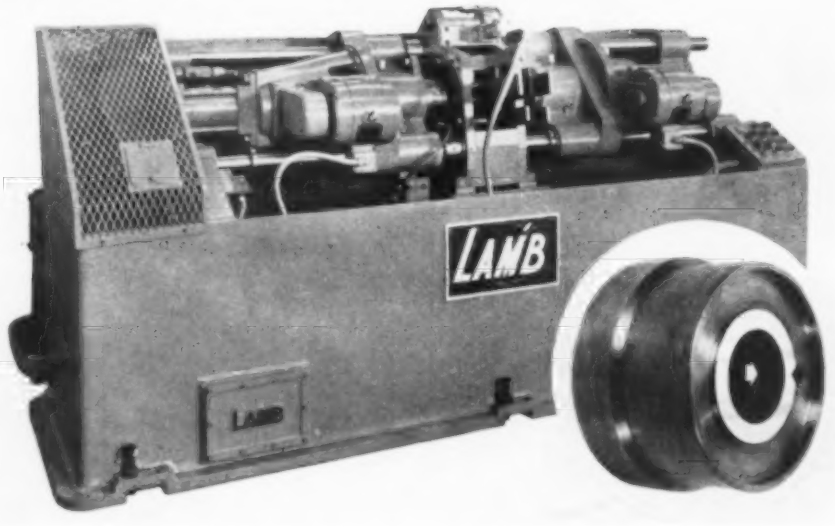
**RIVETT LATHE & GRINDER, Inc.**
DEPT. GF 2, BRIGHTON 35, BOSTON, MASS.




# New Equipment and Materials

For further information on any of the products listed here, use the handy postpaid card opposite page 80.

## Automatic Burnishing Machine




*Automatic machine burnishes two apposing faces of a cast iron transmission drum (shown in the inset).*

In the completely automatic cycle of the high-production burnishing machine, two opposing faces of a cast iron transmission drum are burnished at the rate of 360 pieces per hour. Microfinish is improved from 100 rms to 15-25 rms with minimum change in dimension.

Machine, fixture, and burnishing tool design eliminates critical part positioning. The pressure application of both burnishing tools is equalized to assure uniform finish on both faces. Machining torque and part slippage is eliminated by opposing tool rotation and pressure equalization, according to the announcement.

The machine was designed for integration into a completely automated production line, but can be used singly for manual or automatic operation.

F. Jos. Lamb Co., 5663 E. Nine Mile Rd., Detroit 34, Mich.

Use postpaid card. Circle No. 101

## Live Center Increases Capacity

The one-piece main body of the precision-built live center permits use of a greater than normal capacity bearing in a standard size body. It features a simple six-part design.

Automatic wear adjustment takes place as the tapered roller bearing moves back when wear occurs. The ball bearing is thus pushed back, retaining concentricity, eliminating eccentricity and bearing failure due to neglect of a manual take-up adjustment. The center has a concentricity of less than .0001" tir.

J & S Tool Co., Inc., 87 Dorsa Ave., Livingston, N.J.

Use postpaid card. Circle No. 102

## Loading Device Automates Standard Grinders

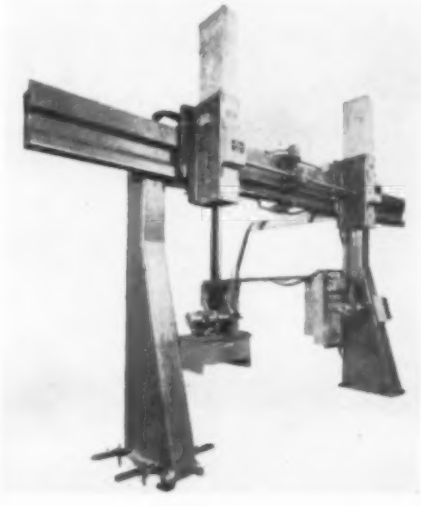
An automatic loading and unloading device can be used to automate standard grinders in transferring work to and from each grinder.

The unit is designed to straddle the grinder being serviced. Since it loads and unloads from both sides of the grinder, it can be tied in to service, on an alternate basis, two automatic conveyor lines—one on each side of the grinder. Cycle time is about 15 seconds.

The loading-unloading unit is said to be built in capacities to meet requirements of each application. In one application, it handles two 75 lb. automotive crankshafts simultaneously.

Wickes Machine Tool Div., 515 N. Washington, Saginaw, Mich.

Use postpaid card. Circle No. 103



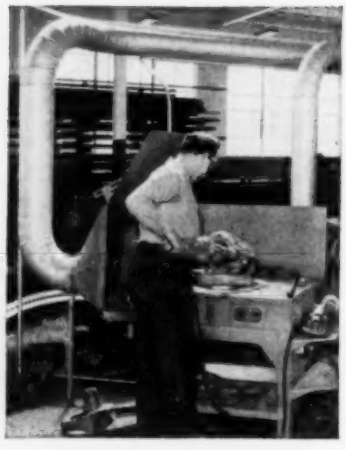
# AIR IN MOTION KEEPS MEN IN MOTION

Dusty or fume-laden air can curtail production and increase maintenance costs by dulling worker efficiency and damaging bearings, motors . . . even machines.

Efficient K & B Dust Control Systems put AIR in Motion to become an important production tool.

In the plant of a noted chain and forging firm, an official made this comment about a new K & B installation: "Our workmen can now work full time . . . this means added production for them and for the company as well."

Call on K & B engineers to put *AIR in Motion* and help boost your plant efficiency. The Kirk & Blum Manufacturing Company, 3124 Forrer Street, Cincinnati 9, Ohio



K & B system serving castings grinding removes dust, sand and chips as fast as they are produced. Work revolves on turntable to enable operator to work continuously.

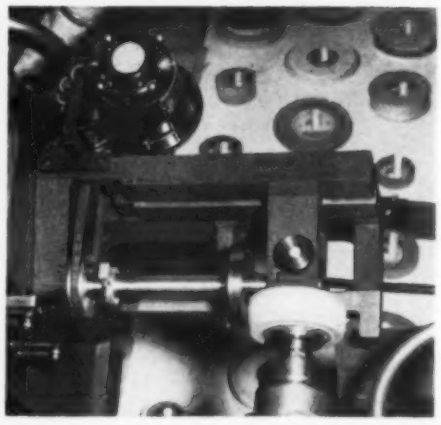
50 YEARS OF SERVICE

KIRK & BLUM

DUST CONTROL

K & B Down Draft Dust Control System in plant of The Monarch Machine Tool Co., Sidney, Ohio

## Surface Grinder Unit for Greater Accuracy



When used with a surface grinder, a motorized center unit is said to make possible concentricity and squareness accuracies of 50-millionths inch. The device is being offered for application in tool rooms and specialty shops. Jobs not normally handled on a surface grinder can be set up easily and ground accurately with the unit.

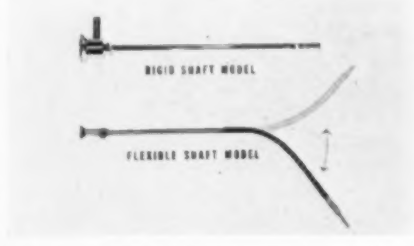
The live center is mounted in a precision ball bearing and is driven by a ¼ hp motor through a speed reducer. Center speed is 78 rpm. By using a heavy-duty powerstat attachment, speed can be varied to achieve exact grinding speeds for different materials and diameters.

AA Gage Co., 350 Fair St., Ferndale 20, Mich.

Use postpaid card. Circle No. 104

## Inspection Instrument

A high-precision optical inspection instrument, called a Bore-O-Scope, has made easy the inspection of internal portions of aircraft engines, aircraft propellers, machines and machined components, equipment in atomic energy installations, and many other hard-to-get-at places. The optical system employed gives inspectors a clear view forward, retrospectively, right angularly, or forobliquely. The instrument is available in various diameters, lengths, and angles of vision. Special instruments can be obtained for inspection under water or other liquids.



The instrument comes in sizes from 3/16" O.D. and up, in a range of lengths from 8" to longer than 15'.

Size Control Co., 2500 W. Washington Blvd., Chicago 12, Ill.

Use postpaid card. Circle No. 105

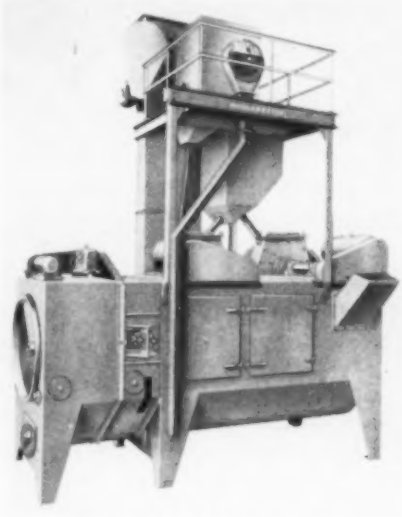
## Tumblast Features End Discharge

The 26" Tumblast has end discharge and is designed to handle a continuous flow of miscellaneous work. The blast cleaning is completely automatic.

The combination of tumbling and longitudinal travel uniformly exposes all surfaces of every part to the abrasive blast of the overhead Wheelabrator unit or units. Thus even the most intricate pieces are cleaned at a production speed geared to any need.

Other sizes in this line are 15", 36", 48", and 60".

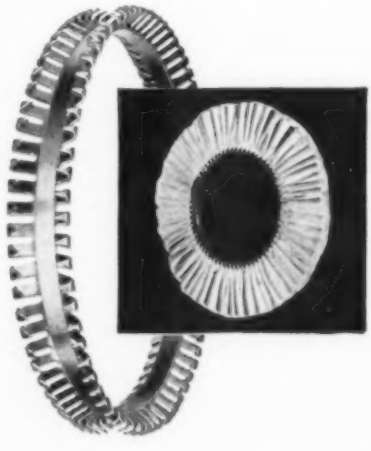
Wheelabrator Corp., Mishawaka, Ind.



Use postpaid card. Circle No. 106

## Triple-Strength Clinch Rings

Clinch rings now available claim to have gripping power never before possible. Company engineers have perfected a projection welding procedure which is said to eliminate the possibility of human error, and increases the uniformity of all types of buffs made by the manufacturer. An improved method of die-forming clinch-ring teeth is also used to produce teeth 25% larger than heretofore.



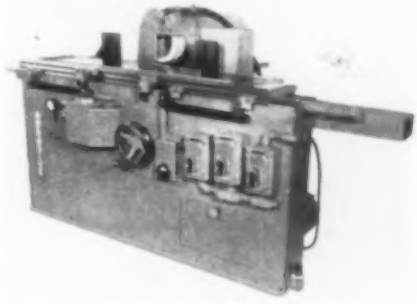
American Buff Co., 2414 S. La Salle St., Chicago 16, Ill.

Use postpaid card. Circle No. 107

## Machine Grinds 1500 Knife Blades in 8 Hrs.

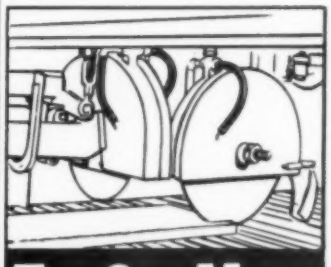
1,500 knife blades, 8" long, can be ground in eight hours on the hydraulic knife grinder available, according to the announcement. It has a 8" x 47" table, a swivel head, automatic rapid traverse between stations, and a 3 hp, 1160 rpm motorized spindle. The grinder can also be used for volume production flat and hollow grinding of parts. Capacity is 2.5 gallons per minute at 1200 rpm. It can be furnished with a wet attachment.

Abrasive Machine Tool Co., Dexter Rd., E. Providence, R.I.



Use postpaid card. Circle No. 108

**High Speed Saw Makes Accurate 25 ft. Cuts on Plate Stock for Chicago Warehouse**



New 122-CX saw now in operation at Chicago Steel Service Company features 2 saws set at 90° angles. Cross cut has 10' travel, ripping saw has 25' travel . . . both cut to desirable tolerances . . . smooth, unbroken edges need little or no finishing. Can be used for wet or dry abrasive cutting. Ty-Sa-Man makes hundreds of types of metal-working saws, cut-off, long cut, mitre, friction, abrasive or combination. Send us your metal-cutting problems.

Ty-Sa-Man
SINCE 1885

FREE CATALOG! Write For No. 1249
**Ty-Sa-Man Machine Company**
1016 White Ave. • Knoxville, Tenn.

## Deburring Tool Works in 7/8" Openings

A miniaturized air-powered tool for deburring, drilling, grinding and polishing is said to rotate at speeds up to 150,000 rpm and operates on 15 to 100 lbs. air pressure. The AirBurr is claimed ideal for tool, die and mould finishing, instrument making, dental laboratory work, gem polishing and other hand operations. Only 13/16" across the corners of the head, it can be used in a 7/8" hole.

The full-floating aluminum turbine rotor and shielded type high speed precision ball bearings will take a deburring tool, carbide drill, grinder, or other tools with a standard 1/8" shaft. Shanks are held securely by a socket head set-screw and may be set flush with the tool face for use in minimum diameter holes. The tool is priced at $24.50.

Ellison Engineering Co., 4530 San Fernando Rd., Glendale 4, Calif.

Use postpaid card, Circle No. 109

## Tilting Tumbling Machine

The tumbling machine may be used for either wet or dry tumbling on plastic or metal, featuring an all metal watertight barrel. The barrel can tilt a full 180 degrees and may be locked in any position. Its measurements are 18" x 24" x 25".

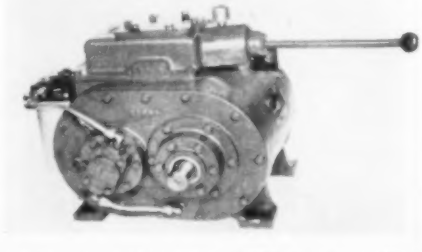
H. W. Kramer Co., Inc., 120-30 Jamaica Ave., Richmond Hill 18, N.Y.

Use postpaid card, Circle No. 110

## Heavy-Duty Transmission

This heavy-duty transmission, series 14800-PF, was designed for use in factories where there may be abrasive dust such as in grinding and snagging departments of steel mills . . . in plants processing materials of an abrasive nature (porcelain, abrasives, etc.), as well as in dust-laden atmospheres such as exist in the manufacture of cereals, flour, and cement. This machine has self contained pump and filter along with special oil seals.

Four speed changes are available with a step-up ratio 1:3 over-all or a reduction up to 10:1 over-all . . . transmission has capacity up to 150 hp directly connected to motor entering transmission at 3470 rpm. It is also adapted for use with motors horsepower capacities 20, 30, 40, etc. where reduction of speeds is wanted. This machine is arranged for horizontal or vertical application and provisions for remote control can be supplied at extra cost.



Western Mfg. Co., 3400 Scotten, Detroit 10, Mich.

Use postpaid card, Circle No. 111


Your Spindles
SERVICED or REBUILT
in HOURS
...not weeks

Here's your spindle ready for reassembly. New super precision bearings from our complete stock of all types of spindle bearings are installed. We've cleaned and checked every part of this spindle for misalignment and flaws—It's ready to go back together for a series of exacting "run-in" tests to make certain the dirty, worn out spindle we received just hours ago is returned to you ready to perform as well or better than it did when the spindle was new!

Gentlemen:

I'd like to have complete information on your spindle repair service.

Name .....

Firm .....

Address .....

City..... Zone..... State.....

BEARINGS, INC.

3640 EUCLID AVENUE • CLEVELAND 15, OHIO

OHIO: Akron • Canton • Cincinnati • Cleveland • Columbus • Dayton • Elyria • Hamilton • Lima • Mansfield • Toledo • Youngstown • Zanesville

INDIANA: Ft. Wayne • Indianapolis • Muncie • Terre Haute

PENNSYLVANIA: Erie • Johnstown • Philadelphia • Pittsburgh • York

WEST VIRGINIA: Charleston • Huntington • Wheeling

NEW JERSEY: Camden • MARYLAND: Baltimore

DELAWARE: Wilmington •

Subsidiaries: Balanrol Corp. • Buffalo, N.Y.•

## Transfer Gage Simplifies Inspection

The Trans-Square inspects the accuracy of perpendicular surfaces easily and with precision. The combination of master square accuracy and the convenience of direct measurement claim assured measurements when used with a reliable surface plate.

The instrument features a hardened steel base which is relieved to permit positive contact with the surface plate to prevent air film error. Height of the 2¼" diameter, .0001" dial indicator is adjustable from 3" to 12" on the graduated column.

The DoAll Co., Des Plaines, Ill.

Use postpaid card. Circle No. 112


**LOWEST PRICES**

**Diamond Wheel Dressers**

Guaranteed to be full, individual stones, mounted in 7/16 x 6" cold rolled shanks

| Carat | Price |
|---|---|
| ¼— | $ 2.25 |
| ½— | 4.00 |
| ¾— | 6.00 |
| 1 — | 8.25 |
| 1½— | 12.00 |
| 2 — | 16.00 |

★ These diamonds can be set in any shank to your specification for $1.00 each extra.

★ Prompt resetting service

**Resinoid Bond Diamond Wheels**

**DISCOUNT 50%**

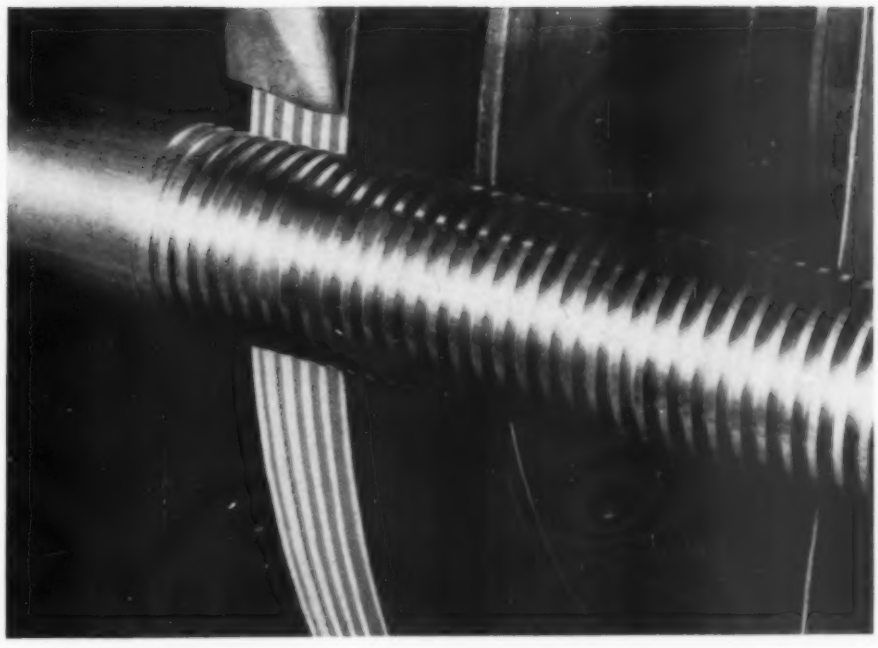
From Standard List Prices

All our products are manufactured in our own plant and are guaranteed for quality, performance, and workmanship.

**Allstate Diamond Products, Inc.**

Manufacturers of a complete line of diamond tools and wheels.

Dept. G 245 W. 27th St. New York 1, N.Y.


W & B *Base permits profitable grinding of Acme threads*

**IN ONE PASS FROM THE SOLID . . .**

*with a diamond-dressed, vitrified wheel*

Universal Thread Grinding Company, Bridgeport, Conn. developed a new method to cut costs and improve accuracy in grinding 5-pitch Acme lead screws. Threads are ground from the solid in a single pass, using a multi-rib vitrified wheel that is dressed to its intricate shape by a template-controlled diamond. The grinding fluid contains a high concentration of White & Bagley HTG Base and is fed under pressure.

Mr. Frank M. Linley, Jr., Partner in Universal, reports that production equals that possible with resinoid wheels, and results in several impressive savings . . .

"Souping-up our blending oil as much as 1-to-1 with HTG Base makes the new method possible", says Mr. Linley. "It improves cutting action, and the wheel holds shape much longer between dressings . . . in fact wheel life is extended 2 to 3 times. Diamond-dressing the vitrified wheel for steep-sided Acme threads is much easier than with resin-bonded wheels, of course . . . more flexible and less expensive than crush dressing. We've been able to extend diamond life about 5 times. Quite a saving at $20 per diamond, not to mention the saving in down-time!"

Mixing White & Bagley HTG Base with petroleum oil is the economical way you can obtain better custom blends for a wide variety of machining operations. Send the coupon below for complete information.

W+B INDUSTRIAL LUBRICANTS

**THE WHITE & BAGLEY CO.**

Worcester, Massachusetts • Detroit, Michigan

*Originators of Grinding Lubricants*

*Sulphurized Fatty Bases*
*Grinding Coolants and Lubricants*
*Cutting, Grinding and Honing Oils*
*Forging Compounds*

**THE WHITE & BAGLEY CO.,** 88 Foster St., Worcester, Mass.

Please send me complete information on W&B HTG Base.

NAME ..... TITLE .....

COMPANY ..... STREET .....

CITY ..... STATE .....

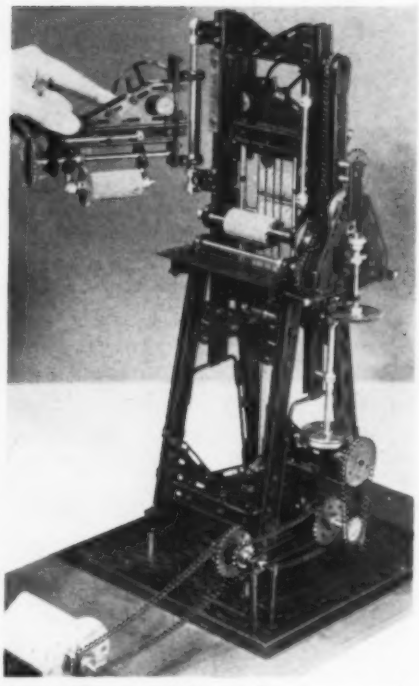
☐ Attached letter describes particular problem on which we'd like advice.

MURRAY WAY "PROVED RIGHT" EQUIPMENT AND ENGINEERING EXPERIENCE ARE THE ANSWER TO YOUR POLISHING, BUFFING AND GRINDING NEEDS.

Whether you need a single, standard polishing head or a specially engineered, fully automatic production line with all the trimmings, Murray-Way can do the job better, more reliably, for greater operating efficiency.

You are invited to consult our engineering staff about your finishing problems.

MURRAY WAY CORPORATION
P. O. BOX 180, MAPLE ROAD EAST BIRMINGHAM, MICH.
*Polishing, Buffing, Grinding, Filtering Equipment that automatically cuts your costs.*

*A working model of a log saw, making use of kit material.*

## Construction Kit to Make Machine Models

A machine construction kit designed to enable engineers, machine designers, scientists, inventors, and automation specialists to make precision working models of practically any type of machine, drive or mechanism, is now available.

The FAC construction system uses a basic construction concept of round rods and beams that are assembled into frameworks by rugged clamping means. A variety of precision-machined mechanical components such as ball bearings; spur, bevel, internal, and worm gears; gear racks, ratchets, among others, are utilized.

It is possible to construct smooth-operating, precision-detailed mechanisms such as reciprocating motions, slide motions, geared transmissions, differentials, and coilspring devices with standard kit components.

The kits are made in two sizes: The FAC-X1 kit is intended for student engineers as well as professional engineers. The larger kit, called FAC-X2, has 4,700 parts especially selected to meet industrial machine design and development requirements.

FAC Division, 9551 Grand River Ave., Detroit 4, Mich.

Use postpaid card. Circle No. 114

## Air Tracking of Abrasive Belts

An automatic air tracking device has been developed for use as standard equipment on Model SPL and TOP machines in 40″ and 50″ model Timesaver Speedbelt sanders.

The device is mounted on the machine behind the sanding drum, and

belt distortion is practically nil. Automatic in operation, the device keeps the belt centered at all times.

Timesaver Sanders, Box 7446, Robbinsdale Station, Minneapolis 22, Minn.

Use postpaid card. Circle No. 115

## Barrel Finishing Machines

A series of barrel finishing machines, called Poliaction, features complete redesign of pedestals, with new drive and tilting mechanism options to meet production-line requirements.

Machines are available in two sizes: No. 1 for barrels 13″ to 22″, and No. 2 for barrels 22″ to 36″. They may be ordered equipped with either push-button Electratilt or manual-hydraulic Hydratilt barrel control, and with either vari-speed motor or vari-sheave drive.

The Baird Machine Co., Stratford, Conn.

Use postpaid card. Circle No. 116

## Tip Protects Gages

To overcome the danger of damage to fragile high precision gage mechanisms, the protector gage tip was developed. The tip and the Cleveland INDI-AC electronic height gage are said to remain accurate to millionths of an inch.

Accidental blows deflect the gage tip, thus preventing the transmission of the blow and subsequent damage to the gaging element. The protector type permits the use of the gage in hole or groove bottoms.

The Cleveland Instrument Co., 735 Carnegie Ave., Cleveland 15, Ohio.

Use postpaid card. Circle No. 117

the BIG difference in DIAMOND WHEELS

**BOND...** the big reason why diamond wheels by J. K. Smit meet your requirements

**EXPERIENCE...** gained from many years of testing cementing mediums and fillers

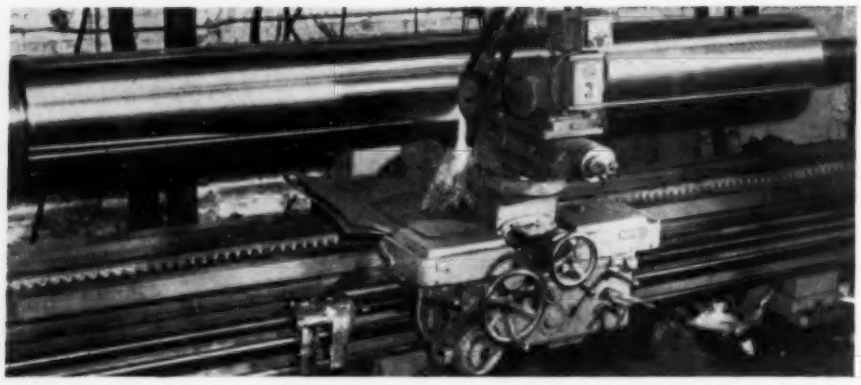
**QUALITY CONTROL...** that insures even distribution of diamond particles throughout every wheel

**ONE SOURCE...** that manufactures all types of metal, vitrified and resinoid bond diamond wheels

*Your copy of Catalog #54 is awaiting your request. Call us direct on any standard or special application*

**J. K. SMIT & SONS, INC.**
HOME OFFICE AND PLANT
MURRAY HILL NEW JERSEY
DETROIT: TORONTO, CANADA

## 50-80% Time Savings With Roll Grinding Attachments



*Roll grinding attachment, installed on standard engine lathe, grinding 17" x 12'8" mild steel roll.*

Abrasive belts and roll grinding attachments developed are said to reduce the time required for grinding either metallic or rubber rolls, while producing accuracy and finishes equal to those obtained by traditional methods of roll grinding. 50-80% time savings are claimed on grinding and polishing steel, cast iron, brass, aluminum and stainless steel rolls, while maintaining the most exacting tolerances specified for either regular or special straight or crowned rolls.

The Carborundum Co., Box 477, Niagara Falls, N.Y.

Use postpaid card. Circle No. 118

## Micrometer Measures 10,000 Small Parts an Hr.

A high precision, motor driven production micrometer is said to handle up to 10,000 spherical pieces per hour, as well as rectangles, squares, tapers, and other shapes. Known as a Roller Mike, the unit is designed to sort and measure small to miniature parts, for precise classification, by thickness, in production quantities or small lots, and with total tolerances down to .000030".

The instrument can sort and grade mica discs, instrument pivots, miniature steel balls, bearings, collars, straight and tapered sleeves and pins, among other items. It is applicable where mass-produced items require sorting out for subsequent high quality close tolerance assemblies, and where higher quality and less rejects can be produced by pregrading of parts.

Micrometer units can be placed in series with each succeeding machine offering further sorting refinement. Automatic feeds can be furnished to provide an unattended operation.

The self-contained unit has removable lid and carrying handle for easy movability. It is driven by a 110 V., 60 cycle, single phase, 3, 25, or 75 rpm motor.

Affiliated Manufacturers, Inc., 60 E. 42nd St., New York 17, N.Y.

Use postpaid card. Circle No. 119


TOP FIRMS SHOW

PROVED SAVINGS UP TO 75%

IN SET-UP AND GRINDING TIME WITH CONTINUOUS WORK INSPECTION AND INFINITE PRECISION

SIMPLIFIED OPERATION

When working with TUNGSTEN CARBIDE, STAINLESS STEEL, STELLITE or TOOL STEELS, VISUAL GRIND permits a semi-skilled operator to grind precision pieces without continued checking with the comparator. Automatic inspection is accomplished with the built in optical comparator.

Visit our plant . . . let us show you how VISUAL GRIND will speed production — cut costs.

Mail this Coupon NOW!

CLEVELAND GRINDING MACHINE
1660 Eddy Road Cleveland 12, Ohio

Gentlemen:

☐ Please have your representative call at our plant. The most convenient time would be (week) _____

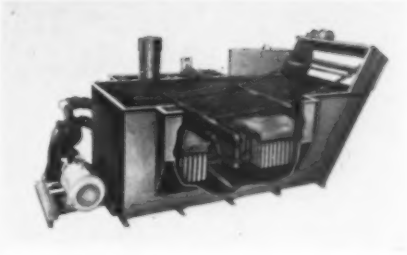
☐ Phone for appointment

☐ Please send us complete information on the new VISUAL GRIND.

NAME _____ TITLE _____

COMPANY _____

ADDRESS _____



## Vacuum Filter Gives Constant Filtration

The basic purpose of the Delpark dual manifold filter is continuous filtration even when cleaning. To accomplish this, the manifolds are on a cycling operation in opposition to each other. When one manifold is filtering, the other is on backwash for cleaning of the permanent filtering elements.

Two forms of filtering elements, and two optional types of filtering media are used. The elements are in leaf-type or tubular forms, and the media is available in either nylon or wire screen. The form of the elements and the media used are contingent upon existing conditions of the specific fluid and contaminants to be filtered.

Flow capacities range from 5 to 1,000 gpm. Higher capacities are handled through use of multiple units.

Industrial Filtration Co., 224 Industrial Ave., Lebanon, Ind.

Use postpaid card, Circle No. 120

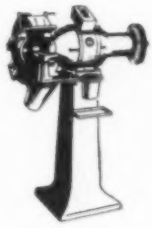
## Rotating Tumbler Cleans Small Parts

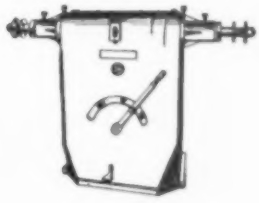
An improved Model T-18 rotating tumbler is designed for the cleaning of small and hard-to-handle parts. It is powered by a ½ hp air motor. Tumbling speeds can be increased or decreased, with throttling powered motor up to a maximum rpm of 120.

The all-steel tumbler design can be submerged in boiling solution, and can be used for cleaning purposes as degreasing of paint, Redskin, plating, and for other dipping purposes.

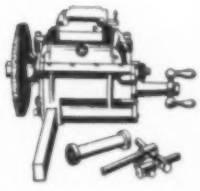
Dayton Rogers Mfg. Co., 2824 13th Ave. So., Minneapolis 7, Minn.

Use postpaid card, Circle No. 121



United States Electrical Tools



Over Sixty Years of Service To Industry

GRINDERS • BUFFERS • DRILLS

**BUFFERS . . .**

Direct, belt, gear, vari-speed buffers.

**GRINDERS . . .**

Direct, gear, belt drive, swing frame, vari-speed single or dual motor, portable, bench, angle plate, die, wet, disc and snagging grinders; combination grinder and buffer.

Electrically and mechanically correct. All rotating parts and spindles are precision-balanced dynamically by latest electronic equipment.

Performance — plus remarkable savings in time and costs — as well as minimum maintenance — these are features to assure your satisfaction.

Precision-engineered and crafted for maximum endurance under exacting conditions . . . tools to speed production or for plant purposes.

**ATTRACTIVELY PRICED**

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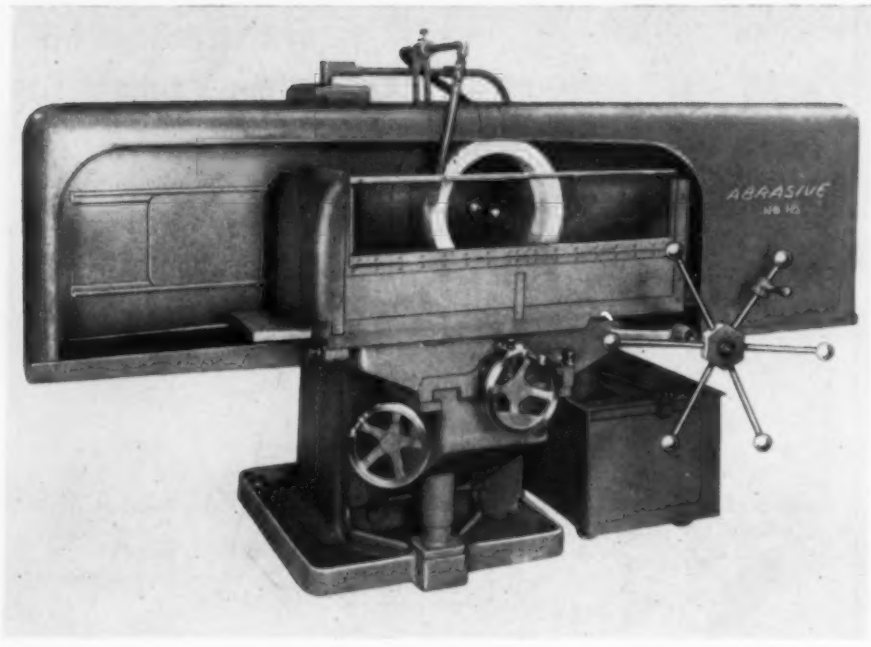
**WRITE FOR CATALOG**

**The United States Electrical Tool Co.**
3640 LLEWELLYN ST., CINCINNATI 23, OHIO




## Power Table Feed on Face Grinder

The abrasive 18" face grinder now is available with power feed to the table. A hydraulic power system with a 2 hp, 1200 rpm motor, the unit is said to provide the equivalent of a 50 lb. push at the handwheel, which amounts to 600 lb. at the table. Maximum cutting speed is 25 fpm and the return is 42 fpm. For safety, the power unit is interlocked with the table handwheel.

The grinder removes metal on flat surfaces speedily and gives a grinding finish. It has a 15 hp, 900 rpm heavy-duty motorized spindle. Box-type way construction provides rigidity for accuracy in grinding any flat or square surface, as well as providing large bearing surfaces.

The machine is used for grinding automobile dies, plastic moulding dies, moulded insulated fire-brick, ceramic insulators, and all types of forging dies.

Abrasive Machine Tool Co., Dexter Rd., East Providence, R.I.

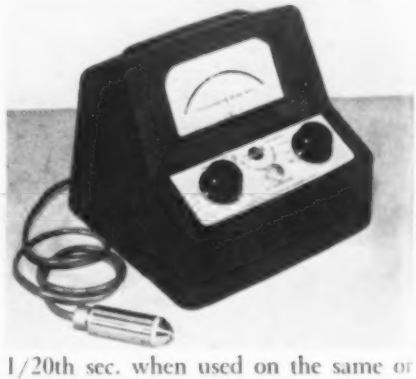
Use postpaid card. Circle No. 122

## Electronic Comparator

The S.I. electronic comparator is designed to meet the need of shops which require quick, accurate process gaging on the machine or at the site of operation.

Construction consists of a gaging head with steel tip that is placed in contact with the work piece, and an amplifier unit which records the magnified movement on an easy-to-read dial.

Because bearings or linkages are not used in the gaging head, accuracy is assured once it is set, and no resetting is required regardless of amount of usage, according to the announcement. The needle repeats its reading in



1/20th sec. when used on the same or dimensionally equal parts. Interchangeable tips can be inserted in the gaging head. Tips of different materials and contours are available.

Accessories available with the comparator are a comparator stand, a signal light indicator, and a multi-gaging head attachment.

Threadwell Tap & Die Co., 16 Arch St., Greenfield, Mass.

Use postpaid card. Circle No. 123


**INVEST JUST 12 PENNIES A DAY**

**TO SAVE DOLLARS THE *Robbins* WAY**

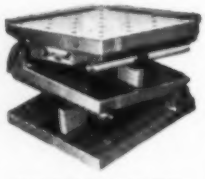
Robbins angular tooling equipment often pays for itself the first few times you use it . . . but let's be conservative. Let's talk about writing off the cost over ten years. (About half the useful life of a "Magna-Sine!") Written off in this manner, the Model A-5 Magna-Sine illustrated represents an investment of around twelve cents a day!

This equipment saves dollars of valuable toolroom time on every job. Set-ups that require *hours* by other methods take just *minutes* the Robbins way. Set up to machine, grind or inspect any angle in just four simple steps: (1) Look up required angle in Table of Constants furnished with unit, (2) Select gage blocks indicated, (3) Place blocks between base and sine bar swivel block, (4) Secure the work . . . and you're ready to go!

This simple, fast, sure method sets up any angle, single or compound, right or left hand, without V-blocks, angle plates or complicated "build-ups." Complete range of models and sizes puts Robbins precision equipment within the reach of every shop. Write now for literature.

HEAVY DUTY SINE PLATE FOR MACHINING

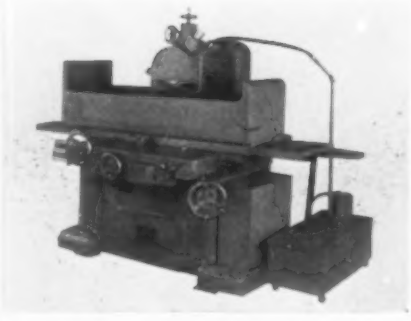
"MAGNA-SINE" WITH MAGNETIC TABLE



FOR INSPECTION AND LIGHT MACHINING

**OMER E. *Robbins* COMPANY**

**11961 DIXIE AVENUE DEPT. K DETROIT 39, MICH.**



## Surface Grinder

The No. 80 Covel 16″ x 36″ hydraulic feed surface grinder features sealed hydraulic oil tank which is mounted outside at right end of machine. The hydraulic pump, motor, and relief valve mounted on platform as a unit is easily removed from front of machine when maintenance is required. The saddle moves on two flat ways. Center guide with hardened steel tapered gib is provided to compensate for any wear.

Covel Mfg. Co., Benton Harbor, Mich.

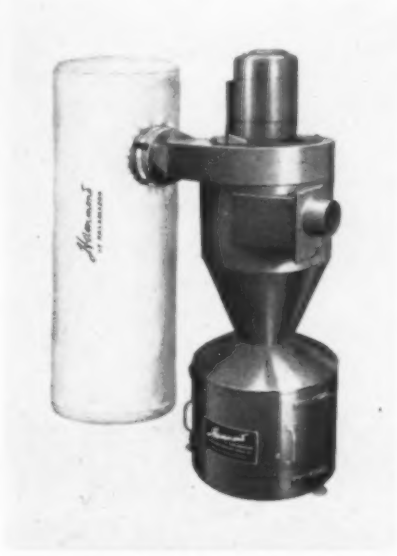
Use postpaid card, Circle No. 124

## Junior DusKolector Needs Little Space

The 53″ high Jr. cyclone DusKolectors are available in two capacities, 400 CFM and 600 CFM, and operate on the principle of centrifugal precipitation and gravitation for the removal of larger particles. The latter are deposited in the removable receptacle in the base. Smaller particles are exhausted outdoors or trapped in a bag attached to the outlet.

400 CFM models operate on ½ hp motor and 600 CFM units require a 1 hp motor.

Hammond Machinery Builders, Inc., 1651 Douglas Ave., Kalamazoo, Mich.



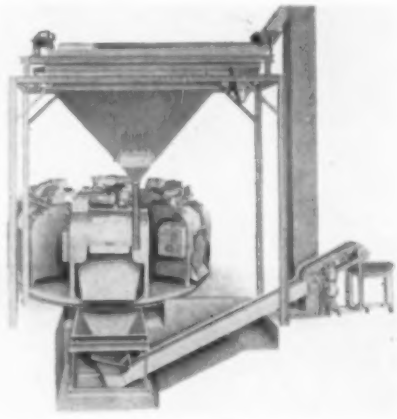
Use postpaid card, Circle No. 125

## Barrel Finishing System Covers Varied Time Cycles in Processing

A six-station automatic barrel finishing system automatically rotates completed work to a single operator station for unloading and reloading. Not only are all materials required for precision barrel finishing conveniently available at this single point, but the system makes it possible for one operator to handle six barrel finishing machines (12 where systems are combined). It does not require duplicate materials handling equipment. Floor area requirements are reduced to a minimum.

As the operator loads each barrel, he sets its timer for a prescribed processing cycle. In so doing, the time cycle also records on the turntable "memory" device, which automatically signals the timed-out barrel and rotates it to the operator's station when the work has been completed. Since each barrel is individually timed, the system will simultaneously deburr and finish a variety of ferrous and non-ferrous parts requiring a wide range of time cycles.

Almco, Queen Products, Inc., Albert Lea, Minn.



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The NEW Hammond FLAT-FINISHER

WILL HELP YOU SOLVE YOUR FLAT FINISHING PROBLEMS

AVAILABLE IN 6" — 7" — 8" SIZES WITH SINGLE OR MULTIPLE HEADS

OTHER MODELS TO 12" ALSO AVAILABLE

Fast, uniform finishing of flat parts!

Grind and polish metal or plastic parts in one semi-automatic operation! Where high production and consistent finishes are required, look for these Hammond features:

**AUTOMATIC AIR TENSIONING**: maintains correct tension on abrasive belts and conveyor belt.

**VARIABLE SPEED CONVEYOR**: rate of feed is adjustable from 0 to 60 FPM.

**WORK HOLDERS**: hold-down rolls, electro-magnetic platen and various types of conveyor belts.

**AMMETER CONTROL**: an ammeter for each head allows operator to determine and maintain the polishing pressure necessary for a uniform finish and longer belt life.

**V-BELT DRIVE**: allows abrasive belt speed to be changed to suit the work.

TYPICAL PARTS FINISHED WITH THE FF-6

SWITCH PLATES

PRINTED CIRCUITS

BRANCHES

FLAT STOCK

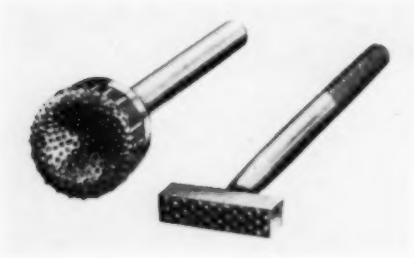
*Send samples and production requirements for an engineering report on your finishing job.*

Hammond Machinery Builders INC.

1651 DOUGLAS AVE. • KALAMAZOO, MICHIGAN

## Diamond Wheel Dresser

A tool called the Ascoblast is 1½" in diameter, and contains over six carats of small whole diamonds set in a hard, durable matrix. Fast and effective, it is good on coarse, hard wheels where



ordinary diamond wear is excessive, according to the announcement.

The tool can be set in any holder accommodated by existing equipment, or may be used as a hand tool set in a ½" x 8" shank.

Soon available is a similar tool of smaller diameter for dressing centerless grinding wheels.

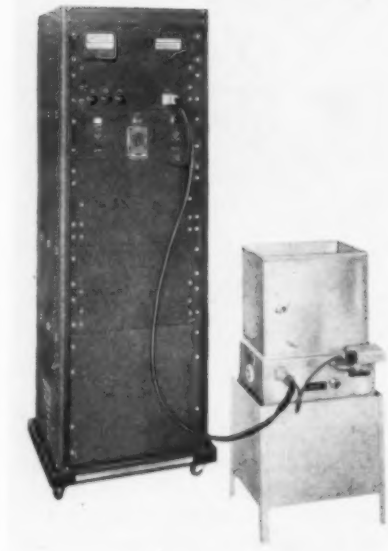
Anton Smit & Co., Inc., 111 Eighth Ave., New York 11, N.Y.

Use postpaid card. Circle No. 127

## Ultrasonic Cleaner For Difficult Cleaning

A 2 kilowatt ultrasonic cleaner has been designed for small part cleaning, blind hole washing, and many difficult cleaning operations.

The electronic generator delivers 2 kilowatts of power to magnetostrictive transducers welded into the bottom of the stainless steel tank. Dimensions of



the tank are 9" x 14" x 13" deep. It holds 5 gallons of liquid. Water cooling of the nickel transducers allows the use of cleaning solutions up to 450 degree F. A water flow switch prevents accidental operation without cooling water flowing. Available either rack mounted or in matching bench-type cabinets.

Alcar Instruments, Inc., 17 Industrial Ave., Little Ferry, N.J.

Use postpaid card. Circle No. 128

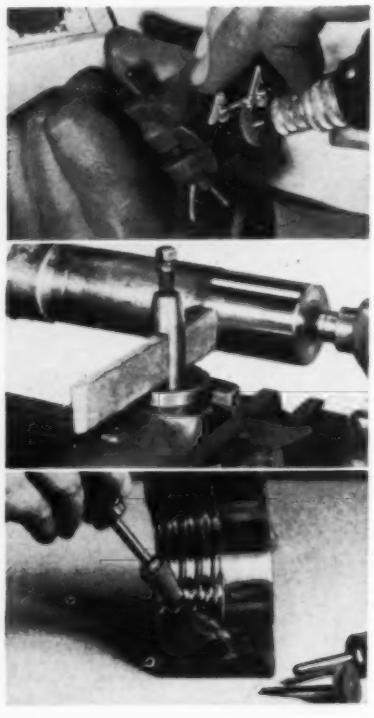

**CUT COSTS**
**SAVE TIME**
**IMPROVE QUALITY**

use **CRATEX**
Rubberized Abrasives

for MICRO-DEBURRING, SMOOTHING, CLEANING, POLISHING on HARD or SOFT METALS and other materials

4 grit textures
Course — C • Medium — M
Fine — F • Extra Fine — XF

**WHEELS • POINTS • BLOCKS STICKS • CONES** for power or manual application and dimensional control. **CRATEX** is sold through leading industrial supply distributors.



For actual field application reports on how **CRATEX** "cushioned action" can cut costs in your own operations, send this coupon.

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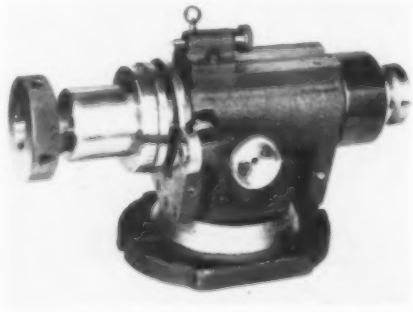
☐ Heat-treated Steel
☐ Special Alloys


## Tool Grinding Fixture Changes Set-Up in 1-2 Min.

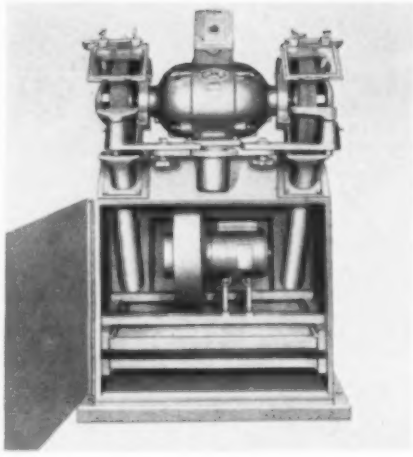
The Studler all-purpose tool and cutter grinding fixture is designed so that even a radical change in set-up, such as from grinding an end mill to index grinding, can be made in one or two minutes, according to the announcement.

The fixture has tool shank cap. from 0" to 1½", with rigid swivel base for accuracy. It is designed for sharpening end mills, center drills, profile mills, taps, and many other jobs.

S & D Engineering Co., 2051 W. Mountain St., Glendale 1, Calif.



Use postpaid card. Circle No. 129



## Grinder With Built-In Dust Collector

The Model 500 general-purpose grinder is newly-designed with a dust collector built in the fabricated base which forms the pedestal of the grinder as illustrated.

The grinder features totally-enclosed motor, push-button starter with over load protection, enclosed adjustable wheel guards, dust-proof anti-friction permanently sealed bearings, tool tray, and lift-out water pot. The dust collector draws dust and abrasive particles from the air into a filter cabinet, and fresh air is returned to the room.

The unit is a space-saver as it is 32½" wide and only 20" deep. The grinder comes in 1, 2, and 3 hp models.

The U.S. Electrical Tool Co., 3640 Llewellyn St., Cincinnati 23, Ohio.

Use postpaid card. Circle No. 130

## Plastic Material Repairs Equipment

"Plastic Metal" is a soft, putty-like material which can be applied to anything that is cracked, chipped, gouged, loose, or damaged. At a room temperature of 70°, it hardens to the consistency of solid steel within 30 minutes, according to the announcement, so that it can be drilled, threaded, machined, ground, sanded, or feather-edged just as you would work any other steel. It is said to bond perfectly with iron, brass, aluminum, bronze, wood, concrete, and other materials.

The material claims to adhere permanently—never dries up, shrinks or expands, and can even be used under water.

A. L. Okun Co., Inc., 109-02 Van Wyck Expressway, S. Ozone Park, L.I. 20, N.Y.

Use postpaid card. Circle No. 131

## Drill Point Grinders

The Malcus drill point grinders grind drill points with accuracy, correct clearance angle, and absolutely identical cutting edges, according to the announcement. The grinding can be performed by inexperienced personnel.

Homestrand, Ind., Larchmont, N.Y.

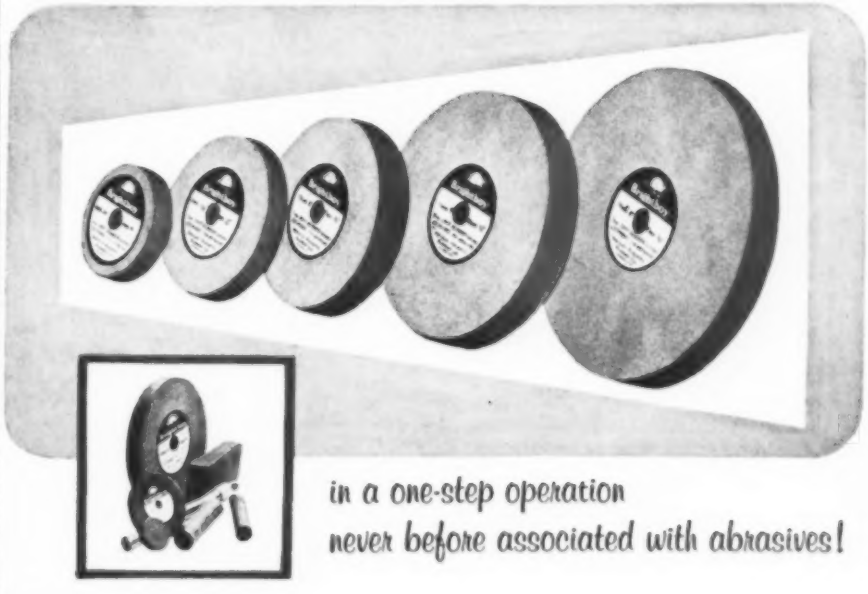
Use postpaid card. Circle No. 132

## Pocket Size Calculator

Handy pocket-size calculator to aid creep test users in the aircraft, steel, aluminum, magnesium, electronic, and titanium industries, claims to quickly and easily give the accurate number of lb. of weight needed to test both round and square test specimens. Free creep load calculators are available. Arcweld Mfg. Co., Box 311, Grove City, Pa.

Use postpaid card. Circle No. 133


**BURR, CLEAN, FINISH, POLISH**



in a one-step operation
never before associated with abrasives!

*Discover*

*Brightboy's new revelation in time-saving finishing! Brightboy's definitely different working action. Brightboy's combination of ABRASIVE and RUBBER, working simultaneously.*

Versatile, multi-use, Brightboy promotes refreshing, new methods, new work short cuts, new finishes. Not only on metals, but also on plastics, laminated materials, wood, glass.

BRIGHTBOY is made in a wide range of wheels and accessory products — rods, sticks and blocks — for machine and manual operations. In STOCK NUMBERS, JOB-MATCHED TO YOUR REQUIREMENTS. In a comprehensive selection of Silicon Carbide and Aluminum Oxide abrasive grains. Each in grades from extra fine to extra coarse. Each in soft, firm and tough rubber binders.

Ask your dealer to recommend the Brightboy number ideally suited to your usual — and unusual — work, and for the Brightboy catalog listing grains, textures, machine speeds, work suggestions. Write us if he cannot supply you, or on any problem in which finishing is involved.

*READY NOW! "Notes From The Brightboy Service Engineer". An informal news letter describing various Brightboy applications reported by Brightboy Service Engineers. WRITE FOR YOUR COPY or ask your dealer.*

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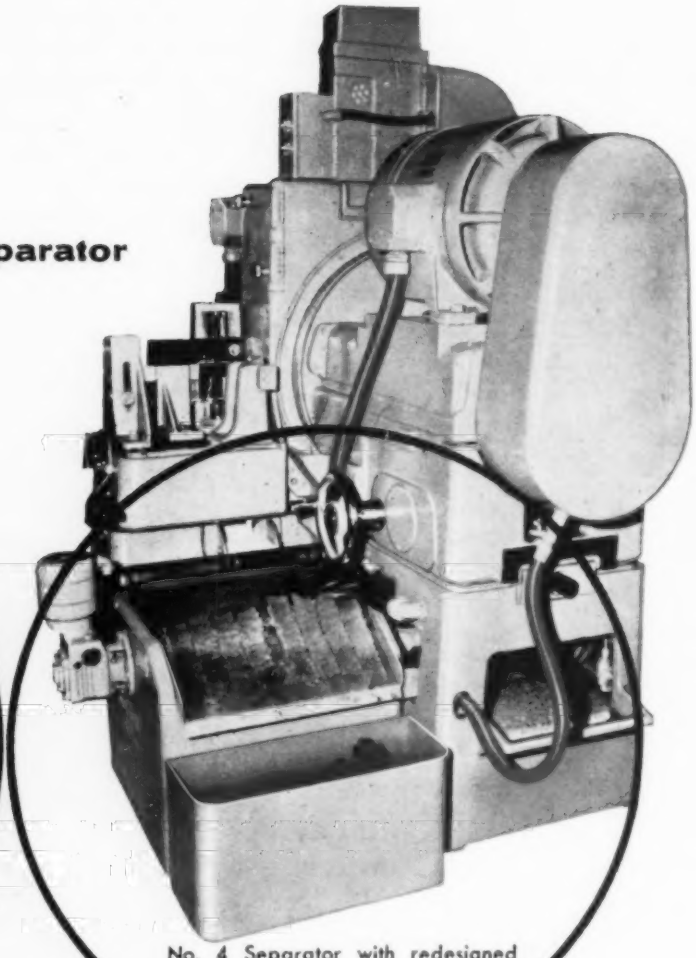
RUBBER CUSHIONED ABRASIVES

BRIGHTBOY INDUSTRIAL DIVISION
WELDON ROBERTS RUBBER CO.
95 North 13th St. • Newark 7, N. J.
*America's Pioneer Manufacturer of Rubber-Bonded Abrasives*

## BARNESDRIL Magnetic Separator

**easily adapts to machine design, saves cost of piping, troughs and tanks**



No. 4 Separator with redesigned housing shown as original equipment on Double Disc Grinder.

This installation shows the flexibility of BarnesdriL Magnetic Coolant Separators as applied to different types of machine design. A standard No. 4 BarnesdriL Separator is used, and the housing extended to the floor. The Separator is hooked directly to the machine discharge and intake, and coolant flows through the separator into the reservoir in the base of the machine.

As a result piping, troughs and outside tanks are eliminated and the separator appears as an integral unit of the machine.

Inherent design of BarnesdriL Separators and Filters lends itself readily to integrating with general machine contours, yet permits easy access and maintenance. Cost savings are realized in the elimination of piping, troughs and outside tanks.

### New design data

BarnesdriL engineers have compiled design data and specifications for adapting separators and filters to various types of metal cutting machine tools, and will be glad to supply information on any particular installation. This bulletin will also show you types of systems and installation. Write for a copy!

FILTRATION DIVISION

COOLANT BARNESDRIL CLEANING

**BARNES DRILL CO.**

888 CHESTNUT STREET • ROCKFORD, ILLINOIS

DETROIT OFFICE: 13121 Puritan Avenue

Grinding and Finishing

# News of Industry

## Elgin National Watch Co. Micronics Facility

The new research and development facilities for the West Coast section of Elgin National Watch Co.'s Micronics Division serves the growing needs of missile, aircraft, and general industry centered in Southern California.

Situated on a four-acre site at 21001 Nordhoff St., Chatsworth (Los Angeles), Calif., the new facility encompasses 20,000 sq. ft. of floor space, and represents an investment in building and modern precision equipment of more than $450,000.

Equipment includes high-precision machine tools, assembly facilities, and testing and inspection gear. The Micronics Division was established to provide vital skills in precision miniaturization as they apply to development and production of devices needed by the military and general industry.

*Elgin National Watch Co.'s West Coast Micronics plant.*

*Typical of the wide range of precision test and inspection instruments in the new West Coast plant of Elgin National Watch Co.'s Micronics Division is the accelerator pictured, used to test completed assemblies under extreme centrifugal force.*

## Hammond of Kalamazoo Has Demonstration Bus

To demonstrate its electrolytic carbide tool grinders and electrolytic chip breaker grinders, Hammond Machinery Builders is putting a completely-equipped bus on the road. The grinders are connected to an Anocut power pack, and the mobile demonstrator carries its own generator.

According to the manufacturer, the electrolytic grinders provide the easiest and fastest grinding of carbide tools ever experienced, reduce consumption of diamonds by 80% to 90%, and substantially increase production.

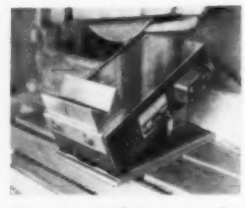
*ASA Board of Directors, Pittsburgh, Pa., Dec. 8, 1957—Seated, left to right: James G. Bair, director; Willard J. Miller, treasurer; John Y. Arnold, president; T. J. O'Connell, national chairman; Jan L. Deelman, secretary. Standing, left to right: Raymond B. Ryder, director; H. P. Dales, director; Leland K. Pruett, director. Absent: John O'Sullivan, Howard E. Swatkins, Frank Blaine.*

# Set 'em up fast and accurate with Magna-Lock Sine Chuck

It's easy! Electro-magnetic chuck eliminates need for cumbersome clamps or fixtures in making setups for angular grinding. Holds work securely during grinding. No distortion, no warping. No dials, no scales. Standard gauge blocks insure accuracy unobtainable by any other means.

Three compound angle sine chuck models—6" x 6½" to 6⅛" x 21⅝" working surfaces, two single angle sine chuck models, two compound angle sine plates, two single angle sine plates—all Magna-Lock precision built. Each furnished with wood case and Table of Constants.

Angular setups made with Magna-Lock are faster, more accurate, cut your costs. Get full details, Dept. GF-28.



Magna-Lock Sine set up for grinding V-block.

Magna-Lock Sine set up for grinding angle surface.

**MAGNA-LOCK, INCORPORATED**
BIG RAPIDS, MICHIGAN, U.S.A.


## Reading Chapter ASA News

Monthly meetings of the Reading Chapter are held the third Monday of each month, at Valley Inn, Pennside, Reading, Pa. at 7:00 p.m. A planned program is scheduled for each meeting dealing with safety, and all phases to improve metal finishing by abrasives.

September meeting: Mr. Malcolm M. Maynes of Norton Co. gave a message aided by a film on "Manufacture of Abrasive Grain."

October meeting: Mr. John A. Mueller of The Carborundum Co., Mgr. of Grinding Laboratory, spoke on "Various Factors Which Affect Production Rate, Wheel Life, Power Consumption, and Abrasive Cost," showing slides.

November meeting: Mr. A. S. Wyborski of the Peninsular Grinding Wheel Sales Corp. showed a film on "Play It Safe" along with his message.

December meeting: Mr. Ben Hardy of the A. P. De Sanno & Son delivered a speech with film on "Cutting-Off." Mr. Cecil Tate, field representative for the ASA, was introduced to the members.

Officers of the Reading Chapter are: Kenneth Weidner, president; Howard Burkhart, vice-president; Joseph Acker, treasurer; Paul A. Miller, secretary.

## Conn. Chapter of ASA

The monthly meeting of the Connecticut Chapter of American Society for Abrasives was held on Dec. 16 at Sun Valley Acres, Meriden, Conn.

Fred Jessop of Cincinnati Milling and Grinding Machine Co. spoke on grinding machines, and showed a film entitled "Age of Precision."

The next meeting will be held at Wright's Tavern, Plainville, Conn., Jan. 27. The program topic will be honing by Micromatic Hone Corp., Detroit, Mich.

## American Society for Abrasives Meeting

At the Detroit Chapter of American Society for Abrasives held at Pleasant Ridge, Mich., a representative of Cincinnati Milling and Grinding Machine Co., Mr. Emil H. Vogely presented motion pictures entitled "St. George and the Draggin" and "The Cost of Operating Obsolete Machinery."

At the meeting the following officers were elected: C. E. Edwards, president; Emil H. Vogely, first vice president, and Fred M. Schlie, second vice president.

Secretary of Detroit Chapter: Eugene Kiezel, Denham & Co., 925 Book Bldg., Detroit 26, Mich.

# Hitchcock Launches Training Course For Fluid Power Equipment Personnel

A home-study program designed to teach men how to install, operate, and maintain fluid power equipment has been announced by the Hitchcock Publishing Co., Wheaton, Ill.

Two of the nation's leading authorities in the field, Dr. R. C. Binder, professor of mechanical engineering at Purdue University, and Harry L. Stewart, who heads the Special Engineering Dept. at Logansport Machine Co., Inc., Logansport, Ind., have joined forces with Hitchcock to develop the course of study, which is entitled, "Installation, Operation and Maintenance of Fluid Power Equipment."

A discussion-type lesson accompanies each chapter. This is to be completed and returned by the student before receiving the next chapter. Each lesson is graded by a trained instructor. Personal comments help to clarify problems which trouble the pupil.

Upon satisfactory completion of the 18-chapter course, a two-day workshop session is scheduled. The student will attend a general assembly for one-half day, where a panel of experts from industry will present panel discussions. The remainder of that day and the next will be spent in small groups directed by the panel members. Particular interests, problems, and ideas will be covered at these sessions.

Each chapter of the correspondence course is profusely illustrated. Subjects are divided into bite-size pieces so that something new can be learned in only a few minutes of study. The student sets the pace, studying in his spare time, progressing as fast as he chooses until all 18 chapters are completed.

Chapter headings are as follows: (1) An Introduction to Basic Hydraulics and Basic Pneumatic Devices and Systems; (2) Pressure, Work and Power; (3) General Features of Machines and Terminology; (4) Hydraulic and Pneumatic Symbols and How They Are Used in a Circuit; (5) Air Compressors and Accessories; (6) Hydraulic Power Devices; (7) Hydraulic Fluids; (8) Piping; (9) Air Filters, Pressure Regulators and Lubricators; (10) Directional Control Valves—Function and Operation; (11) Flow Controls; (12) Pressure Controls; (13) Cylinders—Nonrotating and Rotating; (14) Pneumatic Motors and Tools; (15) Rotary Hydraulic Transmissions; (16) Accumulators; (17) Pressure Boosters; (18) Causes of Circuit Failures.

At the National Fluid Power Association's annual meeting, at Washington, D.C., recently, the announcement and preview of this program was enthusiastically received. Suppliers of fluid power equipment realize that their potential markets are restricted to limitations imposed by the shortage of qualified personnel. As the potential of fluid power increases, the demand and shortage of trained workers increases proportionately.

*Each student receives a loose-leaf simulated leather binder when he enrolls in the course. In this are filed chapters and worksheets as completed.*

Both new and old employees in the fluid power field may benefit from this program. It provides the organized, practical training the novice must have and serves to upgrade the more experienced worker. Besides foremen, shop mechanics, operators, etc., salesmen may take the course to learn how to better maintain the equipment they are selling. It will help junior designers and engineers to provide improved future designs as a result of a more thorough understanding of the problems of operation and maintenance. All that is needed is the desire to learn and a willingness to use some spare time in study.


## Don Oberg tells why the Moore Jig Grinder is an absolute must in any good die shop

by **DON E. OBERG**
General Manager
Oberg Manufacturing Co., Inc.
Tarentum, Pa.
Largest Manufacturer of Carbide Dies

"One of the most important features of an Oberg-built die is guaranteed complete and positive interchangeability of parts throughout the life of the die. *This feature would be practically impossible without the application of Moore Jig Grinders.*

"With Moore Jig Grinders we can accurately locate holes with relation to each other as well as size holes to extreme accuracies. We can efficiently grind contours on carbide die sections which would be impractical by almost any other method. Back taper on contoured carbide die sections and piercing holes can be readily generated on Moore Jig Grinders.

"We feel it would be *practically impossible* to produce the high precision carbide dies required by industry today without the Moore Jig Grinder. *In our opinion it is an absolute must in any better-than-average die shop.*"

As Mr. Oberg points out, the Moore Jig Grinder has no equal on many essential toolroom operations. If you would like a bulletin describing some of the features that make this machine so outstanding, just drop us a line.

"The things we like best about our four Moore Jig Grinders are the sturdiness and dependable long-life accuracy built into them. Ours are used ten hours or more every day. Even with this high activity, we have found no apparent inaccuracies from our oldest to our newest machine."

HOLES, CONTOURS AND SURFACES, Moore's authoritative book, tells how to produce tools, dies and precision parts *the modern way*. 424 pages, 495 illustrations. $5 in U. S. A., $6 elsewhere.

**MOORE SPECIAL TOOL COMPANY, INC.**
**725 Union Avenue, Bridgeport 7, Connecticut**

**ADD MOORE TOOLS TO YOUR TOOLROOM**

JIG BORERS • JIG GRINDERS • PANTOGRAPH WHEEL DRESSERS • PRECISION ROTARY TABLES • HOLE LOCATION ACCESSORIES

## Hill Acme Research Building

The Hill Acme Company, Cleveland, Ohio, manufacturers of hydraulic surface grinders, abrasive belt grinders and polishers, billet and scrap shears, forging, threading and tapping machines, metal cutting knives and machinery castings recently completed their new research building. This building is located apart from the main manufacturing facilities so that development and experimental work can be conducted on new machines without interrupting the normal production schedule in the plant.

The purpose of this research building is to process representative quantities of customers' material, thereby establishing and proving technique, quality and production available on the Hill Acme Company's new type machine tools. At any time, the machines in operation in the new building will be changed to make room for new or varied machines that the company develops.

The machines presently operating in the research building are a 50" wide reciprocating-table type abrasive belt machine for grinding and polishing; a 60" wide continuous process pinch roll type abrasive belt machine for grinding and polishing; a new design 2" single-spindle HA threading machine; and one of the company's new bar-billet shears completely automated with magazine and power feed table for giving square, accurate cuts of any required length at exceedingly high production rates. Other machines still on the drafting board or in process will be set up in this building.

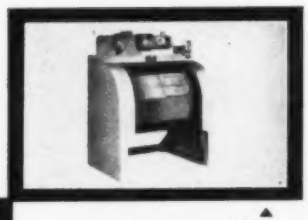
Through the use of this building the Hill Acme Company is now able to provide data and experience on all types of materials, parts, production and tolerances required by their customers.

The photo above was shown in the December issue of GRINDING and FINISHING over the announcement of the Simonds Abrasives Company's new plant at El Monte, California. While this is in fact the main plant of Simonds Abrasive Company, we wish to correct any impression that this plant is the plant which was announced. The new Los Angeles area plant is shown below. This unintentional reduction in size by GRINDING and FINISHING we hope will

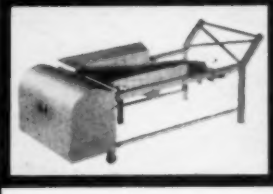
not mar a very successful beginning of this newest manufacturing facility expansion by the Simonds Abrasive Company.


HERE'S A COMPLETE LINE: Globe BARREL FINISHING EQUIPMENT AND MATERIALS

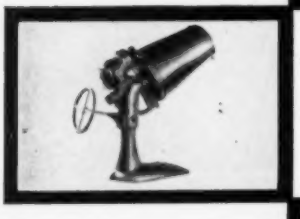
BURR-RITE STANDARD
Available in 5 models, with total barrel capacities from 2.3 to 7.9 cu. ft.



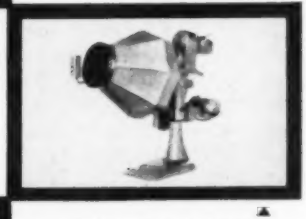
MECHANICAL SEPARATOR
2 models, one portable (shown) and one permanent (with hopper)



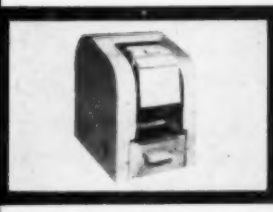
BURR-RITE SENIOR
Furnished in 4 series—(11 different models)—total barrel capacities from 8.2 to 38.4 cu. ft.



DM (DIRECT MOTOR DRIVE)
5 sizes—*Working* barrel capacities from 1 to 11.7 cu. ft. Now available with optional Power Tilt feature.



BENCH MODEL
Total capacity .58 cu. ft.—ample H.P. for all requirements—110 V.—a *complete* unit, all ready to plug in.



FDM (FLASK DIRECT MOTOR DRIVE)
3 sizes available—*Working* barrel capacities from 1.5 to 5 cu. ft. (Power Tilt Model illustrated)

COMPOUNDS: For all barrel finishing needs—deburring, polishing, burnishing, finishing, descaling, rust inhibiting.

MEDIA: To finish all types of ferrous and non-ferrous metals—including aluminum, zinc, stainless steel and brass.

*GLOBE ENGINEERS AND BUILDS CUSTOM BARREL FINISHING EQUIPMENT*

Globe Send in your parts for free analysis and processing!

*Division of Gatalbi Company · 566 Wayne Street · Jackson, Michigan*

## Mechanical Finishing Methods

The size, shape, and variety of work parts that can be processed and finished mechanically are almost limitless, according to process engineers at Roto-Finish Co., in Kalamazoo, Mich., who advise this means rather than using time-consuming manual methods.

A case in point is a job the firm recently completed on a large production run of flapper valves used in refrigeration compressors. The problem was to improve fatigue resistance of the flapper valves, yet remove the sharp, square edges of burred, jagged stressed metal at the blanking edges, and end up with a uniform radius that would minimize valve failure. The application of mechanical finishing methods resulted in complete removal of the stressed metal, and a uniformity of finish.

Mechanical finishing has been successfully applied also by the firm to aluminum housings for electric and pneumatic power hand tools such as drills, buffers, saws, and polishers. Because a commercial finish is achieved when the housing is barrel-finished, it is said to be more durable and wear-resistant than a surface that has been hand-buffed.

From numerous studied applications, the process engineers point out the benefits with barrel finishing methods as a high degree of uniformity while maintaining exact tolerances on precision parts, and a marked saving in finishing costs, sometimes as much as 80% or more.

## Bendix Co. Will Manufacture Automation Devices

Establishment of a controls section of Bendix Aviation Corporation to engineer, manufacture, and sell tape-controlled production systems, including equipment that will use blueprint measurements to produce a finished part, was announced recently by Malcolm P. Ferguson, president.

Ferguson said the new section will offer a new type of "flexible automation" to U.S. industry, from large companies down to small tool and die shops having only four or five machines. He said the tape, or numerical, control process, which largely eliminates the need for manual control in the manufacture of many die parts, jigs, and patterns in the production process, will provide substantial savings in tooling cost and production "lead time."

In the new operation, Bendix will design and build completely automated systems, including associated electronic equipment and drives, to control machine tools in all cutting functions. Tape preparation and other engineering services will also be supplied.

George S. Knopf, formerly executive engineer of the Bendix Research Laboratories, has been named manager of the new operation, which will be located in Detroit.

## Gen. Motors Diesel Engine Addition

Construction has gone forward on a 289,000 sq. ft. addition to the General Motors Detroit Diesel Engine Div. plant in Redford Township, it has been announced. The completion is expected in May. The new building will house all final assembly, testing, and shipping facilities for Detroit Diesel.

An entirely new production system will be installed, including the addition of two new assembly lines for a total of five assembly systems. Clyde W. Truxell, general manager, stated: "We will be able to assemble all engines in the new building, separating the assembly from machinery operations with associated advantages of improved efficiency and quality."

Detroit Diesel produced its 500,000th engine last June. Since its founding the division has built and sold engines totaling more than 73,000,000 horsepower.

## Appointments by Thompson Grinder

**The Thompson Grinder Company,** Springfield, Ohio has appointed the **Southeast Machinery Company,** Fort Lauderdale, Fla., exclusive distributor for Thompson grinders in Florida. Also appointed by Thompson to serve in the North Texas area is **Machine Tool Associates, Inc.,** Dallas, Tex.


Allison
Abrasive Cutting Wheels

**Abrasive Cutting Know-How**

**Know-How is just as vital to top performance in abrasive cutting as in any other machine tool operation**

**PROBLEM: Cut ¾" Bars of Cobalt-Base, High-Temperature Alloy at High Production Rates ... Maintain Length Tolerance with Burn-Free, Burr-Free Cuts**

**SOLUTION: An ALLISON Field Engineer ( all are abrasive cutting specialists) prescribed the particular ALLISON wheel that met these rigid requirements.**

**RESULT: 576 pieces per hour, cutting 8 bars at a time as pictured above... length tolerance consistently held well within ± .015"... All cuts burn-free, burr-free!**

This aircraft parts manufacturer had been unable to hold length tolerance in cutting these high-temperature alloy blanks for forging jet engine blades until he availed himself of ALLISON Abrasive Cutting Know-How and used the prescribed ALLISON wheel.

**Allison Recommendations Pay Off**, whether you cut titanium, stainless steel or other high temperature metals. ALLISON Abrasive Cutting gives you Fast, Economical, Quality Cuts.

ALLISON *wheels are available in a tremendous range of formulations—rubber or resinoid bonds—3" to 34" diameters—.006" to 3/16" thick—*

*For More Complete Information write for this helpful booklet—*

ABRASIVE CUTTING by ALLISON

ACCO

**Allison Division • AMERICAN CHAIN & CABLE**

**254-F Island Brook Avenue, Bridgeport 8, Conn.**

won't cut carbide

**THE PROPER BOND IS NECESSARY**

To reduce carbide cutting costs to a minimum, every Diamond particle must constantly have sharp angular faces exposed to the work piece. Pressurelok bond controls each abrasive grain just as long as facets of that Diamond present sharp cutting edges. Pressurelok uses uniformly graded Diamond (no fines) of *warranteed* density in the world's finest bond.

**TOO SOFT:**
Soft bonds may wear too rapidly around the Diamond grain leaving them insufficient support and causing premature release. Contact with the work piece can tear Diamonds from too soft bedding before they have reached optimum performance.

**TOO HARD:**
Hard bond can cause the bond line to recede too slowly not allowing Diamond grains enough exposure to give new cutting faces. This causes over-heating and loading of the wheel.

**be SURE . . . get**

**PRESSURELOK®**

**HERE'S WHY PRESSURELOK WORKS BEST.**

Pressurelok is the best of Diamond Wheels because it scientifically combines warranteed amounts of graded Diamonds distributed in constant density throughout a perfect bond which wears uniformly at the ideal rate of Diamond wear.

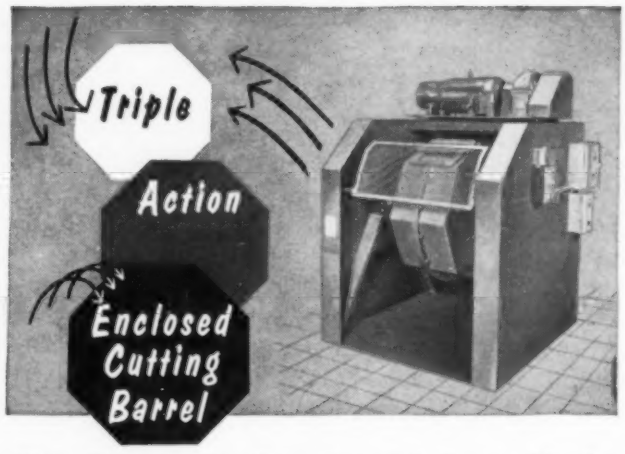
*Specify Pressurelok . . . We've Never Failed To Deliver.*

US

**UNITED STATES DIAMOND WHEEL CO.**

835 ILLINOIS AVENUE AURORA, ILLINOIS

Write for new catalog 957 — make your savings great in '58




***The Finest Cutting Barrel Ever Made***

Hartford's great new enclosed barrel speeds deburring, descaling, polishing on screw machine parts, stampings, and castings. Hartford's unique *Triple Cutting Action* produces the highest degree of uniformity . . . faster . . . at lower cost. Extremely compact with every modern feature for efficiency, safety, and cleanliness. Available in 4 and 10 cu. ft. barrel capacities. Write for complete literature.

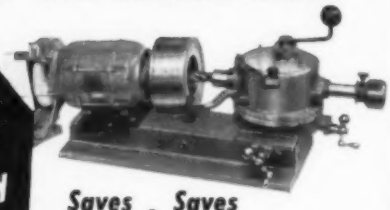
**Hartford**

**PRECISION BALLS • RETAINERS BEARINGS • TUMBLING BARRELS**

**Hartford Steel Ball Co., Inc., 112 Jefferson, W. Hartford 6, Conn.**

***Super* MULTI-SPIRAL END MILL GRINDING FIXTURE**

**SHARPENS END MILLS Quickly . . . Completely IN YOUR OWN SHOP**



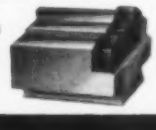
***Saves Time • Saves Money***

For grinding or milling of any spiral lead. Pays for itself in a hurry. Send for facts today.

***SPIRAL* SPECIAL CUTTING TOOLS**

**Cut Operations 75% or More!**

Custom-designed, precision made, exactly to fit your needs. Boost both output and quality. Ask for details.



***SPIRAL***
STEP TOOL COMPANY

*Designers and Manufacturers of All Types of Special Cutting Tools*

*5400 N. Damen Ave. • Chicago 25, Ill.*
*Phone: LOngbeach 1-5384*

L. H. Milligan, Assoc. Dir. of Res. & Dev., Norton Co.

N. N. Ault, Asst. Dir. of Res. & Dev., Norton Co.

L. Coes, Jr., Asst. Dir. of Res. & Dev., Norton Co.

N. W. Thibault, Asst. Dir. of Res. & Dev., Norton Co.

C. H. Quick, Asst. to Dir. of Res. & Dev., Norton Co.

## Norton Co. Appointments

The Research and Development Dept. of Norton Co. has been reorganized to facilitate the transmission and handling of problems between the Research and Development Dept. and the various manufacturing divisions. Four major sections will now handle abrasives, refractories, basic exploratory research, and laboratory services.

**Dr. Lowell H. Milligan,** formerly assistant director of research and development, has been appointed associate director of research and development. In this newly-created position, he will be responsible for liaison with patent attorneys on laboratory patent matters, and progress of outside research projects.

**Dr. Neil N. Ault** has been appointed assistant director of research and development in charge of the Refractory section. He joined the company in 1950, the same year he received his doctorate in Ceramic Engineering at Ohio State University.

**Loring Coes, Jr.,** continues as assistant director of research and development, but will now be in charge of the Exploratory Research Section, which will make a systematic evaluation of new ideas and theories which may pertain to the improvement of existing products or to new products. He has been with the firm since 1938.

**Drs. Herbert F. G. Ueltz, Guy Ervin, Jr.** and **Leo P. Tarasov** have been appointed research associates, reporting to Mr. Coes.

**Dr. Newman W. Thibault** continues as assistant director of research and development, a post he has held since 1953, but will now be in charge of the Abrasive Section.

**C. Herbert Quick** will continue as assistant to the director of research and development and will now be in charge of the Service Section. A Cornell University graduate, he first came to the company in 1924.

## Ex-Cell-O Corp. Promotions

**Robert W. Ford** has been appointed sales manager of the Machine Tool Div. of Ex-Cell-O Corp., Detroit, and **Herbert A. Knack** has been made sales manager of the Continental Tool


# "We Cut Form Grinding Time OVER 33% . . .

***COMPLEX GRINDING WHEEL FORMS ARE PRODUCED IN MINUTES . . .*** *by simply traversing the tracer lightly over an easily made template. A 10-to-1 ratio between template and truing diamond insures work accurate to "tenths."*

**WRITE NOW FOR FREE PRODUCT LITERATURE . . .** and see for yourself how a P&W Diaform Attachment can bring new speed, precision and economy to your form grinding operations. Just fill in and mail the handy coupon.

## Using P&W Diaform Wheel Forming Attachments," says The B. JAHN Company.

Using Pratt & Whitney Diaform Wheel Forming Attachments, the B. Jahn Company, Inc. of New Britain, Conn. now form-trues grinding wheels—accurate to .0002" or better—*in minutes!* As a result, average time for producing the high-precision contoured punches and dies, which this company supplies to the aviation industry, has been cut 33%. Costs have been cut proportionately and busy machines released for other work. B. Jahn also likes the Diaform's *portability*, light weight, low initial cost and easy operation. As B. Jahn's chief engineer states, "We can take a man—and don't have to take our most experienced man—and in no time at all have him turning out precision work that is *better* than the old timers could *ever* do by other grinding methods."

**PRATT & WHITNEY COMPANY**
INCORPORATED
6 Charter Oak Boulevard, West Hartford 1, Connecticut

*Please send my free copy of P&W Diaform Circular No. 543-3.*

NAME _____ POSITION _____
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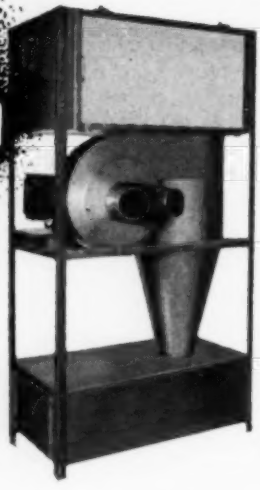
CO. ADDRESS _____
CITY _____ ZONE ____ STATE _____

# EFFICIENT–LOW COST

## Dust Collection



Easy installation . . . efficient low-cost operation . . . simplified maintenance, make Dustkop *FIRST* among equipment to collect most all industrial dusts. There are Dustkop models to eliminate your dust problems . . . that are space saving, self-contained units; or exhaust type for rafter, ceiling or outside location. Write for descriptive literature.

**DUSTKOP STOPS DUST**

37 STANDARD MODELS TO CHOOSE FROM

• *READY TO USE*

***Also a Complete Line of Mist Collectors***

**AGET** MANUFACTURING COMPANY

1380 E. CHURCH ST. • ADRIAN, MICHIGAN

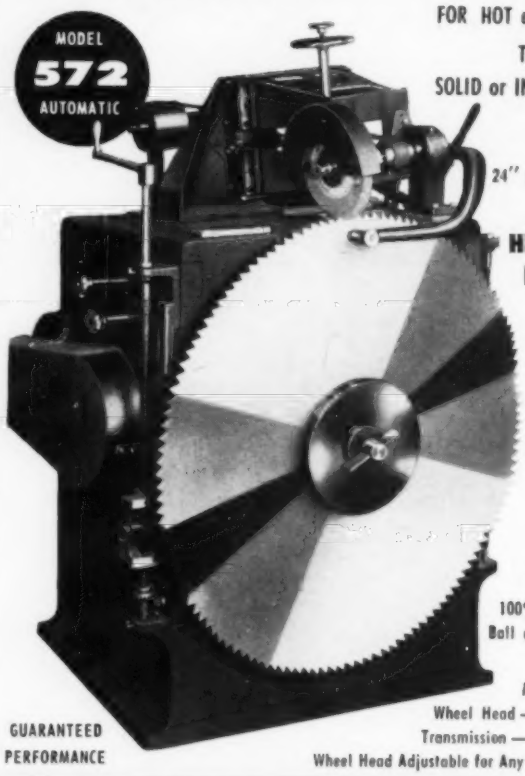
# HANCHETT METAL SAW SHARPENER

FOR HOT and COLD SAWS

TYPES

SOLID or INSERTED TOOTH

MODEL 572 AUTOMATIC



CAPACITY

24" to 72" and Larger

**HEAVY DUTY**
**POWERFULL**
**SMOOTH**
**ACCURATE**

DEALER INQUIRIES INVITED

BEARINGS

100% Anti-Friction Ball and Roller Types

MOTORS

Wheel Head — 2 H.P. — 1800

Transmission — ½ H.P. — 1200

Wheel Head Adjustable for Any Saw Tooth Angle

GUARANTEED PERFORMANCE

**HANCHETT MANUFACTURING COMPANY**

Main Plant BIG RAPIDS, MICH.

West Coast PORTLAND 1, ORE.

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## World Renowned COATED ABRASIVES

### The Difference Saves You TIME and MONEY

Now the famous HERMES coated abrasives are available to the discriminating U.S. market. There is a difference — HERMES products are precision fabricated in a wide variety of sizes and types to do each job best and last longer. HERMES quality has been internationally known for over 30 years.

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*Exclusive U.S. Agents* **UNITED MINERAL & CHEMICAL CORP.**

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*R. W. Ford, Sales Mgr., Machine Tool Div., Ex-Cell-O Corp.*

*H. A. Knack, Sales Mgr., Cont. Tool Works Div., Ex-Cell-O Corp.*

*Rudy M. LaPierre, Mgr., Bushing Sales, Ex-Cell-O Corp.*

Works Div. **Rudy M. LaPierre** was appointed manager, Bushing Sales.

Ford has been associated with the firm since 1936. After ten years as sales representative in the Pittsburgh territory, he returned to be assistant sales manager of the Machine Tool Div. at the head office in 1948.

Knack joined the organization in 1939. In cutting tool sales work from the beginning, he has been assistant sales manager of Continental Tool Works Div. since 1949.

LaPierre came to be with the company in 1940. He was brought into the sales department in 1952. For the last year he has handled drill jig bushing sales exclusively.

---

**Otto A. Pfaff,** chairman and president of Wheelabrator Corp., Mishawaka, Ind., has retired as president and will continue as chairman of the board. **James F. Connaughton,** executive vice president, has been elected president.

Pfaff has been with the organization since 1916 and served 22 years as general manager and 17 years as president and general manager. He spearheaded the consolidation of the firm's New York, Chicago, and York, Pa. operations in Mishawaka in 1926. He is a director of Bell Aircraft Corp., Buffalo, and the Signode Steel Strapping Co., Chicago.

Connaughton resigned last June as president of American LaFrance Corp. to join the firm. He is a former vice president and general manager of the Eddystone Div. of Baldwin-Lima-Hamilton. Connaughton is a director of Sterling Precision Corp., New York City; American LaFrance, Elmira, N.Y., Yawman & Erbe Furniture Co., Rochester, N.Y., among other companies.

## P&W Appointments and Sales Territory Revisions

**Clinton E. Smith** has been named administrative sales manager for Pratt and Whitney's Machinery, Cutting Tool and Gage Divisions, it was announced by Edward P. Gillane, president.

Mr. Smith, who joined the company in 1931, has served successively as sales engineer, as manager of Kellerflex sales, and as assistant to general sales manager. He is president of the Solid Carbide Institute and has been active in affairs of the Society of Carbide Engineers.

At the same time, Mr. Gillane announced a major revision of sales territories for the Cutting Tool and Gage Divisions of the company, and named three company executives who will have charge of each division.

**William C. Mullin,** authority on instrument gages and automation gaging systems, will spearhead sales of products in a territory that parallels the East and West Coast. He was formerly chief engineer of the Magnetic Gage Co. in Akron, and joined the organization in 1947 as a gage designer.

**Albert F. Miller, Jr.,** will manage cutting tool and conventional gage sales in the East-West territory. He began his apprenticeship at the company in 1935, and has served as sales engineer and sales manager.

**Alford H. Johnson** will manage all gage and cutting tool sales in the Mid-Continent sales territory. He united with the firm in 1934, and has served as sales engineer.

---

**Russell L. Kavanaugh** of South Bend, Indiana, has been appointed sales representative in Indiana, southwestern-


**STONE CUT-OFF MACHINES do a better job**

**FASTER, CLEANER and at LOWER COST!**

Stone

**12" or 14" (Swivel Head) CUT-OFF MACHINE**

**CAPACITY:** Ferrous, 1½" Solids, 2½" Standard Pipe and 2½" Structurals. Non-Ferrous, 2½" Solids, 3" Tubing and Extrusions.

**MODEL M-35A** is equipped with a quickly adjustable positive-locking swivel head for cutting up to 45° in either direction, providing superior operation at a lower original cost than any other comparable machine. Positive geared-in-head drive delivers all of its power to cutting wheel. The machine is designed and built to give you long, trouble-free service under the most rugged conditions. Adaptable for wet cutting.

**MODEL M-35B** (12" or 14" Cut-Off Machine) has same capacity as Model M-35A. Straight edges adjustable for 90° or 45° cutting. Adaptable for wet cutting.

**MODEL M-35** (12" Cut-Off Machine) for 90° cutting has same capacity as Model M-35A.

Power stroke of cutting head and other optional equipment available for all of above. All three machines cut at a rate of less than 4 seconds per square inch, leaving a mill-like finish.

***For specifications, optional equipment and costs, write to:***

**STONE MACHINERY CO., INC., 121 Fayette St. Manlius, N.Y.**

STONE MACHINES ARE REPRESENTED IN EVERY MAJOR INDUSTRY THROUGHOUT THE WORLD




For information about any advertised product, see the Advertisers Index and Action Card inside back cover

TUMBLE
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FINISH
OFFERS

## On tumble finishing equipment!

Grav-i-Flo again scoops the field with new lower prices for its standard line of finishing equipment and supplies. Now—gain Grav-i-Flo's experienced know-how plus lower prices—and *really* save! *Send for complete price lists* on 2 compartment machines in sizes 48", 36", 32" and 24"!

**GRAV-I-FLO CORPORATION**
Dept. GF2, 400 Norwood Avenue, Sturgis, Michigan

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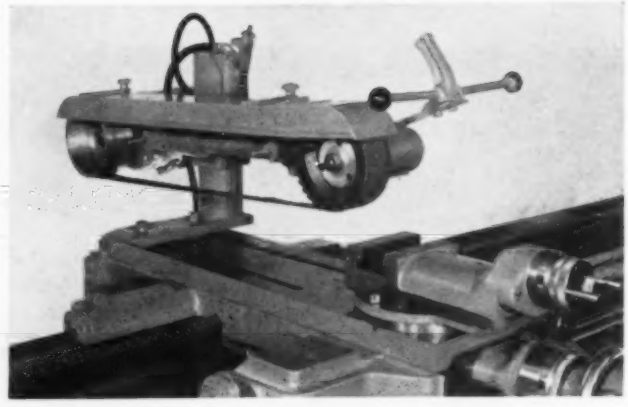

## A SPECIAL APPLICATION OF THE 6-72 UNIT

The G & P 6-72 Abrasive Belt Unit is a machine in its own right, mounted on a stand or hung from the ceiling. But it lends itself ideally to hundreds of special applications, where it can become as handy as a third arm. Illustration shows the G & P 6-72 mounted on a lathe, courtesy Sidney Machine & Tool Co., of Sidney, Ohio. Write for informative Bulletin No. 104 and Price List.

**Grinding and Polishing Machinery Corp.**
SUCCESSORS TO VONNEGUT MOULDER CORPORATION
2530-B WINTHROP AVENUE, INDIANAPOLIS 5, INDIANA

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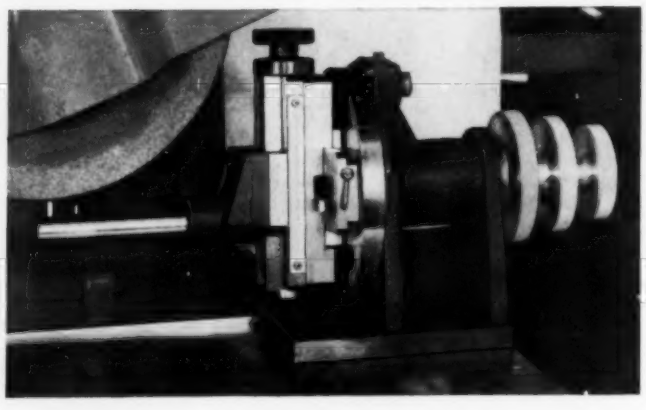


## NOW . . . DRESS ANY WHEEL FORM

**in half the time with the direct reading**

## TANGI-MATIC DRESSER

- completely self-contained
- dresses any combination of tangents and/or radii
- no special skill required to do precision dressing
- greater accuracy thru bottom dressing method

*See your Threadwell Distributor or write for free bulletin T-244*

Threadwell
**THREADWELL TAP & DIE CO.**
**Greenfield, Mass.**

---

## *Cut Costs*

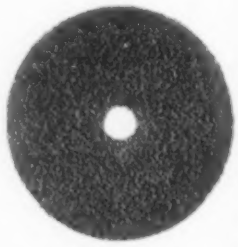
- *FAST CUTTING*
- *LONG LASTING*
- *COOL RUNNING*
- *SAFETY IN USE*

**1** **MARVEL** will hold its shape better and lie flatter on the wheel in areas of the country where humidity is high.

**2** **MARVEL** is faster cutting, regardless of weather.

There are many more important reasons why you should use MARVEL Resin Bonded Abrasive Sanding Discs for the sake of Economy, Quality, Efficiency and . . . best of all . . . for your sake!

*So, please write, wire or telephone for further information or demonstration.*



WRITE FOR
**MARVELOUS**
USES FOR
**MARVEL**
SANDING DISCS

**Bates** PRODUCTS, INC.
1129 East 74th St.
Chicago 19, Ill.
Telephone PLaza 2-0430

Michigan area for the Michigan Tool Company. Kavanaugh's office will be at 404 West Washington Avenue, South Bend, Indiana.

---

**Alfred C. Ekberg** has been named district manager at the Detroit office of Pratt & Whitney Co. He succeeds **Samuel J. Matchett,** who is retiring from the company after 34 years' service.

Ekberg, a graduate of Worcester Polytechnic Institute, joined the organization as a special apprentice in 1936. From 1946 until the present he served as sales engineer attached to the firm's Cincinnati branch office.

---

*John R. Keates*
*Sales Mgr., Natco*

*Gerald L. Bourdages*
*Sales Promotion Mgr.*
*International*
*Research & Development Corp.*

**John R. Keates** has been appointed General Sales Manager of the Machine Tool Division of the National Automatic Tool Company, Inc., according to N. M. Forsythe, vice president and general manager Keates has been Regional Sales Manager for Natco in the New York area since 1943. He became associated with Natco in 1935, a year after his graduation from the University of Cincinnati with a degree in Mechanical Engineering.


**ATTENTION**
**Agents & Shop Personnel**

Agents wanted to sell new silicone base, all purpose, barrel finishing compound. Shop personnel may act as agents in spare time. Confidential.

**Grinding & Finishing**
**222 E. Willow, Box No. 17, Wheaton, Ill.**



**WANTED**

Well known diamond tool manufacturer interested in exclusive representation in Western Pennsylvania, Eastern Missouri, Rocky Mountain area, Northern California, Southern California, Northwest Coastal States, New Jersey area, and industrial Texas. Representative with limited lines preferred.

**GRINDING & FINISHING**
**Box 19** **Wheaton, Ill.**


**Gerald L. Bourdages** has been appointed Sales Promotion Manager by the International Research and Development Corporation, Columbus, Ohio. Mr. Bourdages' background includes a French education, four years as a linguist for the Department of Defense, and author contributing to the leading national magazines.

---

**Gerald Carlisle** has been elected secretary of Micromatic Hone Corporation. He joined the company in 1942 as comptroller, and was made treasurer in 1952. His appointment as secretary is an addition to previous responsibilities.

---

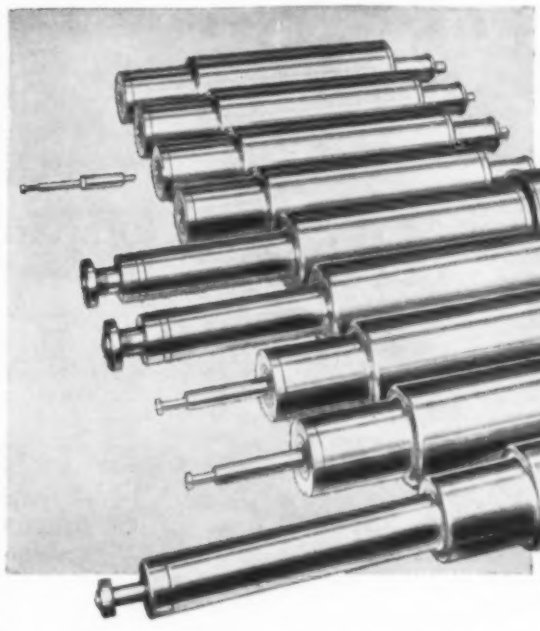
**Ray W. Gauss** has been promoted to the position of assistant treasurer. Gauss has held various accounting positions with the firm. Last July he was named special assistant to the treasurer.

*G. Carlisle, Secy., Micromatic Hone Corp.*

*R. W. Gauss, Asst. Treas., Micromatic Hone Corp.*

---

**John W. McCue** has been appointed a field engineer at the Indianapolis district office of Norton Co. A graduate of Bates College, McCue joined the company in 1946. He was a boron carbide engineer for two years, and changed to abrasive wheel sales in 1950. In 1951, he was appointed an abrasive engineer.

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**SUPER-PRECISION**
**Spindles**
**LEAD THE**
**WAY IN**
**INDUSTRY!**

**STANDARD** Super-Precision Spindles represent the ultimate in rugged construction, trouble-free maintenance and adaptability. In use on a thousand jobs in industry the nation over. Every Standard spindle is "checked out" electronically in our sound-, vibration-, dust-proof laboratory before approved for delivery. Write today for catalog.

Makers of more than 800 different Super-Precision Spindles for **ORIGINAL EQUIPMENT MANUFACTURERS, REBUILDERS AND USERS**

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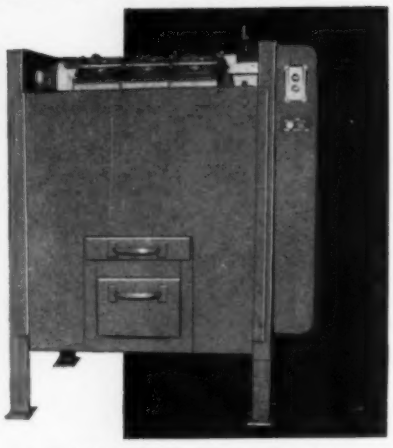
**the STANDARD electrical tool co.**
**SUPER-PRECISION SPINDLE DIVISION**
**2478 River Road • Cincinnati 4, Ohio**

NEW, CABINET-TYPE

# BARREL FINISHER

- Model DLX combines precision finishing machine, fast media separating unit.
- has multiple compartments—2.2 cu. ft. total capacity.
- direct chain drive handles heavy loads in deburring, micro-finishing, polishing.



**CUT COSTS!** Scores of finishing jobs are done faster, easier, and better—with the new Rampe Model DLX. It combines all the heavy-duty features of a high-production barrel finisher and a fast media separating unit. Reciprocating Screen Drawer and Hopper Pan are built-in time-saving features. Others include variable speed, **"No-Seam"** vinyl plastic barrel linings, choice of two or three compartment models, and heavy-duty all-welded construction.

**INTERESTING DETAILS** are available in new catalog data sheet. Write for your copy today.

**RAMPE MANUFACTURING CO.**
**14917 WOODWORTH AVE., CLEVELAND 10, OHIO**

BARREL FINISHERS • SCREEN SEPARATORS • COMPOUNDS • NYLASLUGS

# ACCURACY .0002 T.I.R.

.0002 T.I.R. or less at Spindle Nose, .0005 T.I.R. or less on Test Arbor six inches from Spindle Nose

SPINDLE SPEEDS 150 and 250 RPM Other Spindle Speed Pulleys Available

MODEL B943 MOTOR DRIVEN WORK HEAD

No. 11 B & S Tapered Spindle Standard Equipment. No. 12 B & S or No. 5 Morse Available at Slight Extra Cost.

Clip ad to your letterhead and send for Literature

**K. O. Lee Company, Aberdeen, S. D.**

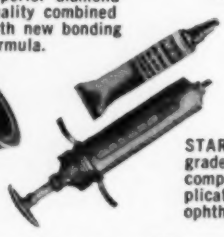
*Now... From one outstanding source!*

*All Your Diamond Abrasive Requirements*

THE *Star Dust* LINE!

A COMPLETE RANGE OF LABORATORY GRADED DIAMOND ABRASIVES FOR EVERY PURPOSE

STAR DUST DIAMOND WHEELS AND HONES
Superior diamond quality combined with new bonding formula.



STAR DUST Laboratory graded Pure Diamond Powders

STAR DUST Laboratory graded diamond lapping compounds in 18 gram applicator gun—or in 5 gram ophthalmic tipped tube.

You can put your confidence in the STAR DUST line as so many others do because STAR DUST quality is consistent quality—the result of our special process of laboratory crushing and grading to achieve uniform nodular shape. That means *all* particles work for you. Be "Laps Ahead." For easier grinding and mirror finishes specify STAR DUST products.

*Send for Catalogue GF-5*

**ACE ABRASIVE LABORATORIES**
**35 ROSELLE STREET MINEOLA, NEW YORK**

grind... sand... polish quicker and easier!
USE
**AIRETOOL**
PNEUMATIC GRINDERS

Grinding and finish work is completed faster . . . more economically with the powerful, easy to use Airetool equipment.

AIRETOOL HORIZONTAL GRINDERS handle the most rugged metal removal jobs. Lightweight, balanced design with long shank for handling ease. Controlled speeds up to 6000 RPM, 4" to 8" abrasive wheel.

AIRETOOL VERTICAL GRINDERS cut finish time on flat or curved surfaces. Powerful, smooth running, easy to maneuver. Capacities from 4" to 9" cup wheel, sanding disc or wire wheel.

ABRASIVE BELT attachment on Horizontal models for finish welds, seams and contours.

*Write for Pneumatic Tool Catalog No. 63.*

**AIRETOOL**
MANUFACTURING COMPANY
SPRINGFIELD, OHIO

REPRESENTATIVES: in principal cities of U.S.A., Canada, Mexico, Puerto Rico, South America England, Europe, Italy, Japan, Hawaii.
EUROPEAN PLANT: Vlaardingen, The Netherlands.
CANADIAN PLANT: 37 Spalding Drive, Brantford, Ontario.

**WALLS TU-WAY BELT SANDER**

*USE IT EITHER WAY*

Full 1/3 h.p. G. E. Motor

VERTICAL

At last, a top quality industrial sander that provides all the most wanted features — yet sells for so little.

complete with cord, plug, switch ready to use **$89.95**

*Illustrated Literature on Request*

A few desirable distributor territories still available.

**WALLS SALES CORPORATION**
333 Nassau Avenue Brooklyn 22, N. Y.


## $2½ Million Addition to Bell Aircraft Corp.

Bell Aircraft announced it is beginning construction of a $2½ million addition to its main plant located on the Niagara Falls Blvd. in the town of Wheatfield. The addition will contain about 220,000 sq. ft. of floor space.

Leston Faneuf, company president, stated, "This substantial investment will raise the value of Bell Aircraft's Niagara Frontier facilities to approximately $30,000,000, most of which is contained in the Wheatfield facility. Consolidation . . . will give us one of the most completely integrated facilities in the country for the development and production of guided missiles, airplanes, and various substantial systems and components in the electronics and rocket fields."

## Whitney Tool Appointed Distributor

Kenneth Cowlin, sales manager of the grinding wheel division of **Electro Refractories & Abrasives Corp.**, announces the appointment of **Whitney Tool & Supply Co.** of Hartford as distributor for the lines of resinoid and vitrified wheels in the State of Connecticut.


there's a **PRESTALLOY®** "PRESSURE-SET" *Oriented* **DIAMOND DRESSER** to meet your **Specific Needs**

Whether you use single or multi-stone settings . . . in unipoint, spade-type or profile dressers . . . you'll find PRESTALLOY offers you a complete, immediate selection of clean-cutting, long wearing tools. And only PRESTALLOY gives you the established advantages of "Pressure-Set" mounting . . . an exclusive diamond-anchoring method that insures maximum dressing speed and efficiency! In addition to the regular PRESTALLOY line (a few of which are shown below), our flexible production facilities enable us to quickly produce for you non-standard and special wheel dressing tools to meet your exact specifications. Let us quote on your requirements.

*Write for your copy of the new PRESTALLOY catalog and price list.*

**DIAMOND PRODUCTS, INC.**
333 Prospect St • Elyria, Ohio
Dealerships available in some areas

**get ALL universal features plus real economy . . .**

**STERLING "G-2"**
***Universal***
**TOOL & CUTTER GRINDER**

*Sterling Features include . . .*

- 25° Tilting Spindle
- 360° Spindle Rotation
- Anti-Friction Table
- 180° Table Swivel
- 2 Speed Table Traverse
- 10¾" Swing Over Table
- Rugged Construction

***Accuracy, Long Life and Low Upkeep are Built-In***

From the heavy cast, vibration damping, base to the two speed motorized tilting spindle the STERLING "G-2" is built for easy operation and maximum accuracy. Set-ups can be made faster on a wider variety of jobs because of the built-in versatility of the STERLING "G-2". Work is finished more accurately, too, because of the built-in stability.

For maximum capacity, versatility and accuracy with minimum investment, investigate the STERLING "G-2" Universal Tool & Cutter Grinder. Plain grinder also available. Ask your STERLING Dealer or write direct for details.

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# A GUARANTEE FOR YOUR CRYSTAL LAKE GRINDER

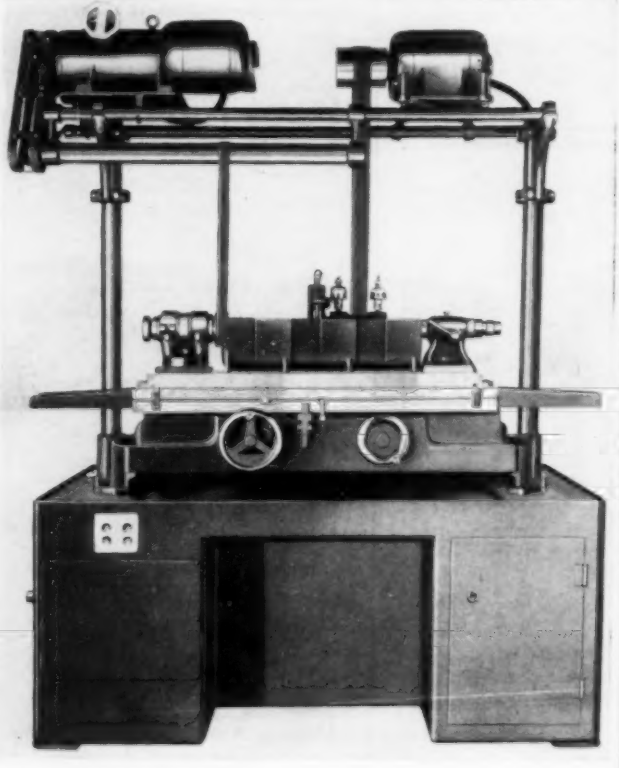
When purchasing a REX SUPERVAN HIGH SPEED STEEL SPINDLE for your Crystal Lake Grinder an additional $50.00 to the purchase price will give you a TWO YEAR SPINDLE GUARANTEE.

**EASY OPERATION: CLOSE TOLERANCES:**

**ACCURACY: FINE MICROINCH SURFACE FINISH**

A CRYSTAL LAKE GRINDER will hold size as well as grind round from .000005 to .000020" and finish from One to Four Microinch SURFACE FINISH. The essentials in grinding are a round spindle, taper bearings, a spindle that can be adjusted periodically without the squashing of bronze boxes and to have belt pressure ninety degrees from grinding pressure so the bronze boxes will not wear out of round.

For example, fuel injectors, after having been rough ground, can be ground to .000010" roundness with a sixty grit wheel and one pass of the wheel.



*Write for literature*

## CRYSTAL LAKE GRINDERS

*Since 1910*

**CRYSTAL LAKE, ILLINOIS**

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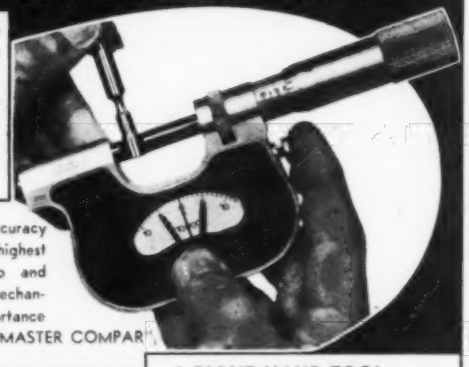
The "MASTER COMPAR"

# INDICATING MICROMETER COMPARATOR

*has the VISIBLE feel*

No Arguments as to correctness of reading due to "feel". Use it as Comparator, Master Micrometer, Go & No Go Gage. 1" Range reading in **1/10,000"**



To attain permanent accuracy at these close limits, highest precision workmanship and exclusive design of mechanism are of Major Importance and ONLY found in "MASTER COMPAR".

**0-1" SIZE IN HARDWOOD CASE** $115.00

*Also Available in LARGER SIZES*

**A RIGHT HAND TOOL**

*Release button for movable Anvil on RIGHT Hand side enables you to hold tool the conventional way.*

**NEW—**

**Resetting to Zero in 5 seconds**

**Quick adjustable tolerance hands.**

**Heavy TUNGSTEN CARBIDE Anvils will actually measure Out-of-Roundness, Ovalness & Taper.**

**Ask for Illustrated Circular — Code GIOFF**

***Sold thru Tool Supply Houses***

***Ask for Demonstration***

## GEO. SCHERR CO., INC.

COMPLETE LINE OF PRECISION INSTRUMENTS

**200-GF LAFAYETTE STREET • NEW YORK 12, N.Y.**

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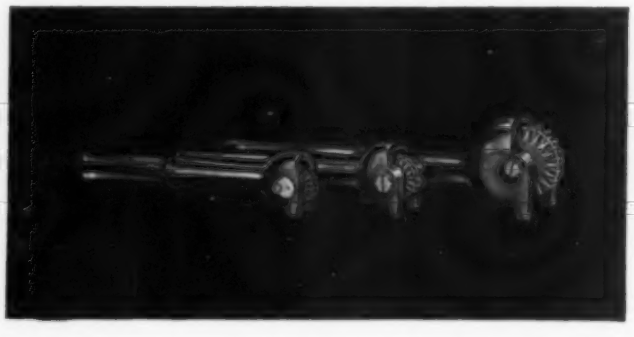
# UP PRODUCTION



More pieces ground per hour, longer wheel life—yours if you dress grinding wheels properly and regularly. It's easy with Desmond Huntington dressers, available in five sizes for all sizes of average grinding wheels. Special dressers too—precision, heavy-duty, diamond, and others. Ask your Desmond distributor or write direct for full information.

*The only complete line of grinding wheel dressers and cutters*

## Desmond

THE DESMOND-STEPHAN MFG CO., URBANA, OHIO

# Why Sterling adds a sixth element to your grinding wheel formula

YOUR GRINDING WHEEL'S performance is determined by the five elements that make up its specification: abrasive grain, size, grade, structure, and bond. But in determining the precise formulation of these five elements, Sterling always considers a *sixth* element.

**The sixth element** is the *human* element: the operator himself, his work habits, personal preferences, and all the other little things that make your job unique. Considering the vital sixth element may mean the difference between success and failure on any grinding operation.

**Sterling grinding wheels**—formulated with the sixth element in mind—can cut your grinding costs, reduce grinding time, and get maximum production from your machines. That's why it's sound practice to call in a Sterling Abrasive Engineer, or your nearest Sterling Distributor, for a complete study of your grinding operation. Do it soon.

Sharpening tools and cutters like this milling cutter is cooler, easier with Sterling vitrified cup wheels.

"Wheels of Industry"—Vitrified and Resinoid—to meet the exact requirements of industry.

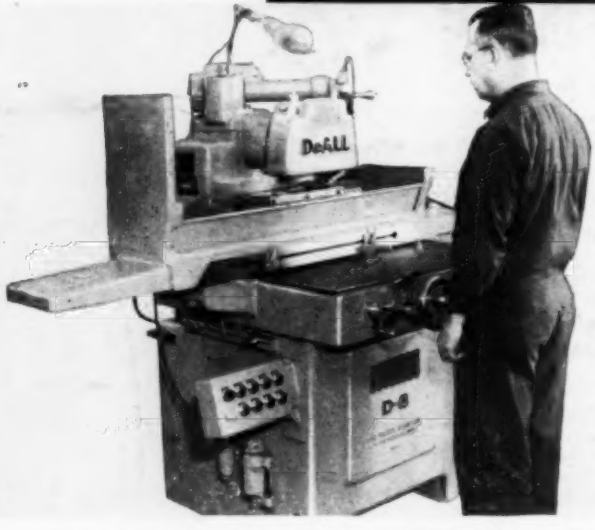
# STERLING GRINDING WHEELS

STERLING GRINDING WHEEL COMPANY, TIFFIN, OHIO—SUBSIDIARY OF ABRASIVE AND METAL PRODUCTS COMPANY

# Can Your Surface Grinder Do This?

## Hold .0005" Accuracy and .0002" Parallelism in One pass over these 3½" diameter rings

**The DoALL GRINDER Does IT EVERY TIME!**




Here's another "proof positive" success story for DoALL surface grinders! The Taber Instrument Corporation of North Tonawanda, N. Y., subcontracts the precision surfacing of helicopter rings which have to be held to "tenths."

Forged and heat-treated rings come to the Taber plant slightly warped, where the grinding operation not only has to provide flat parallel plane surfaces for subsequent machining operations but also bring the thickness to the desired finished size. Using an ingenious fixturing device, the operator surface grinds one side using 1/32" cross feed and a .005" deep cut. The other side of the rings are then ground to bring them to final size in one pass holding dimensional accuracy consistently to .0005" and parallelism to within .0002".

Let us show you how the DoALL grinder takes the guesswork out of your surface grinding. It has rigidity, reliance on hand wheel setting and "Cool Grinding."

**ASK FOR A FREE DEMONSTRATION** — Compare a DoALL with any surface grinder in your shop. See it in operation on a DoALL demonstration unit right in your own plant. Call your local DoALL Store or write.

**FREE MOVIES** — Sound and color to show you the ultimate in precision grinding. Call DoALL locally or write.

**FREE CATALOG** — Shows design and construction of DoALL Grinders and accessories including "Cool Grinding."

Find Your DoALL Store In The 'Yellow Pages'

GR-21

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